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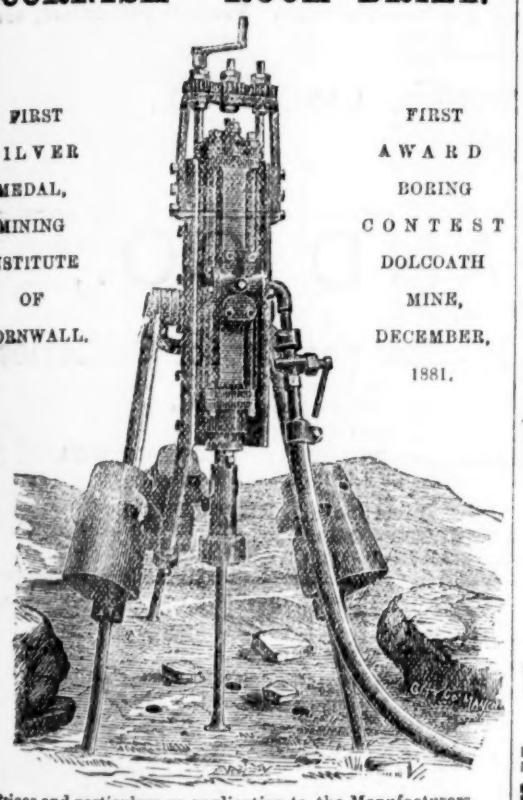

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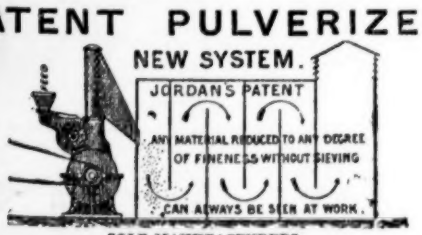

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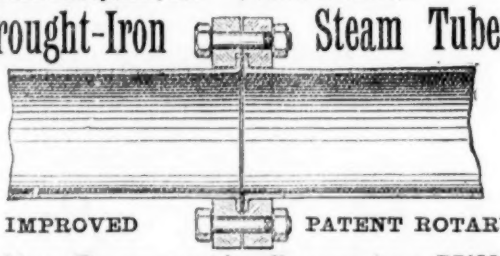

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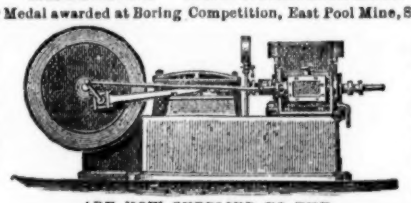

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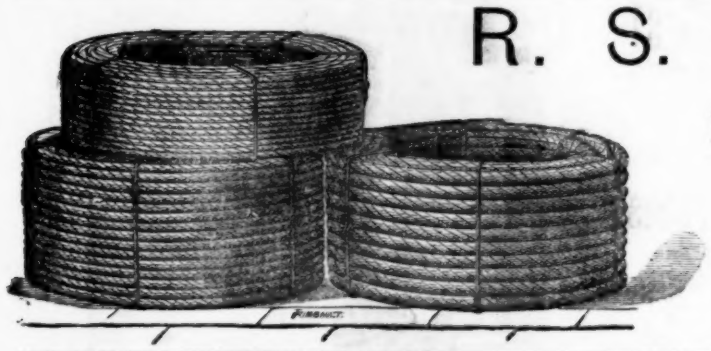

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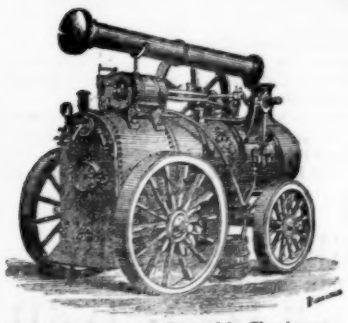

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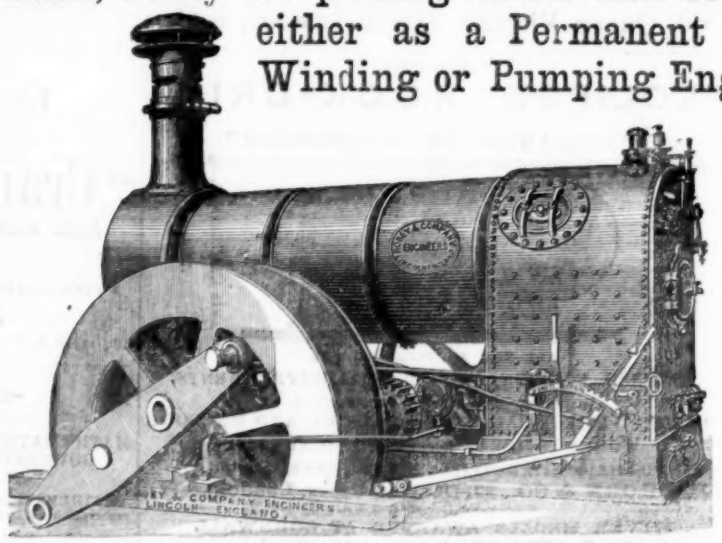

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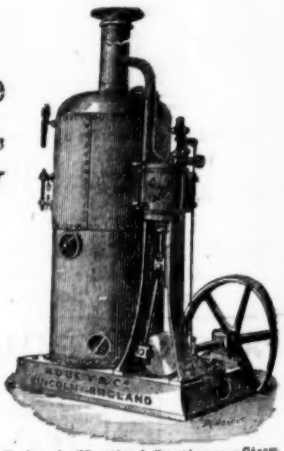

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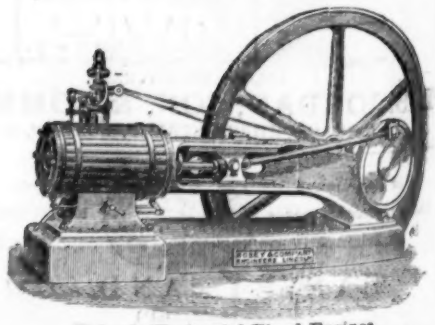

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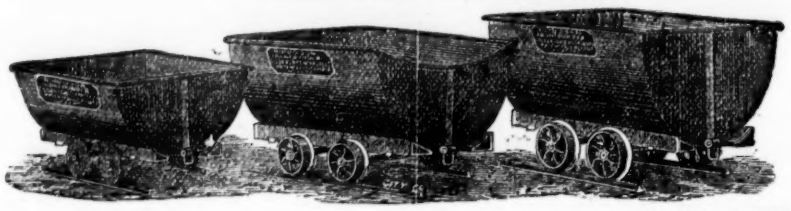

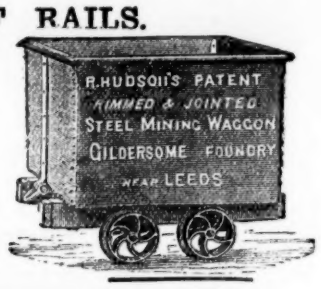

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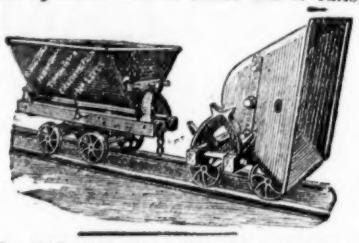

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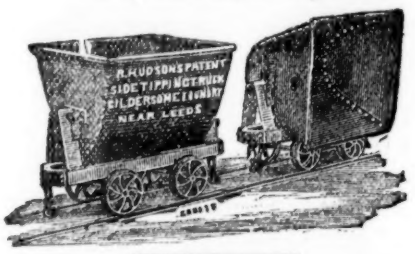

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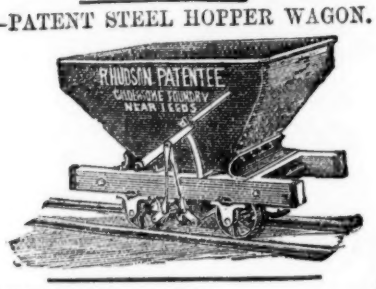

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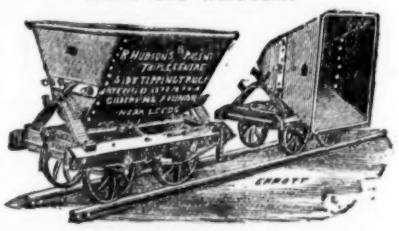

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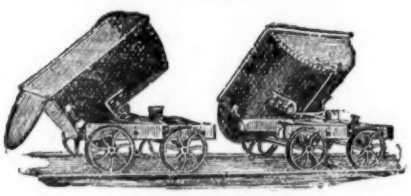

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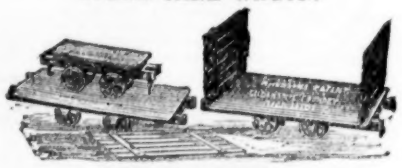

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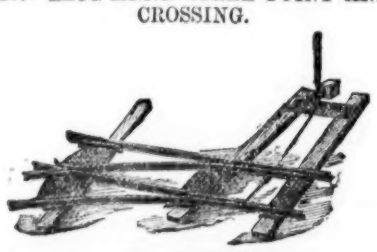

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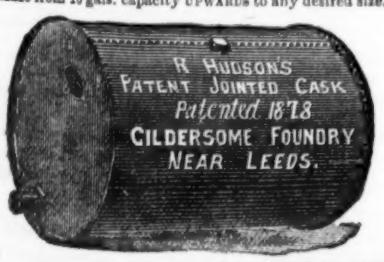
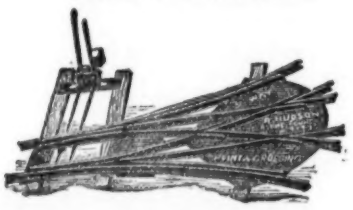


11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.



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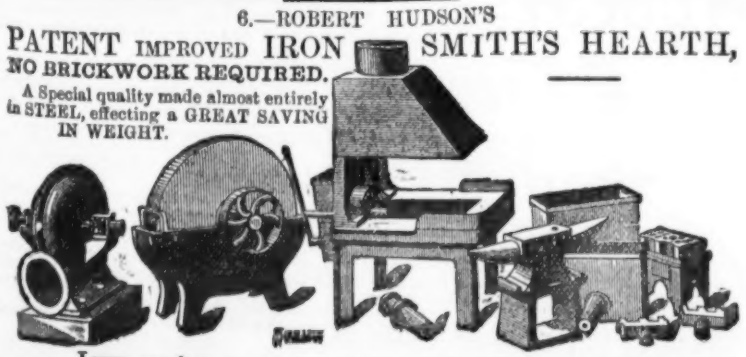

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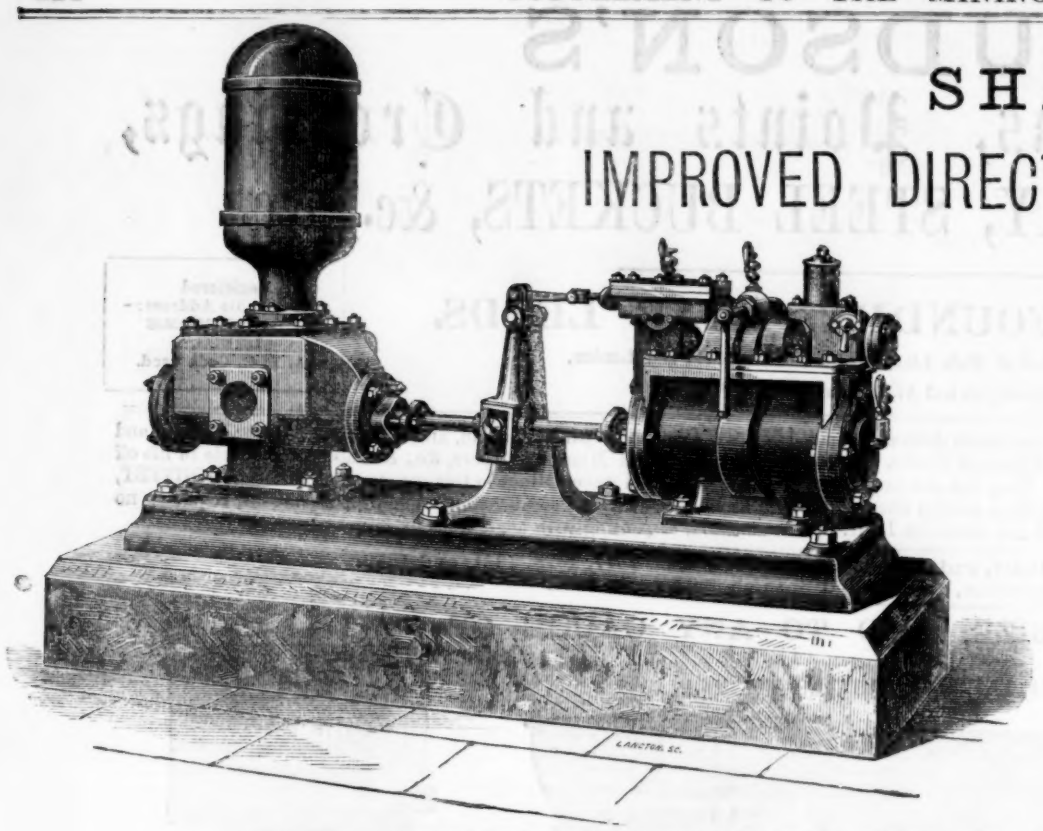

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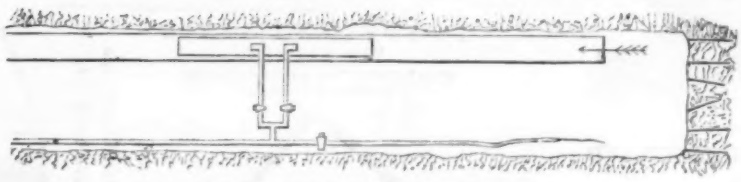

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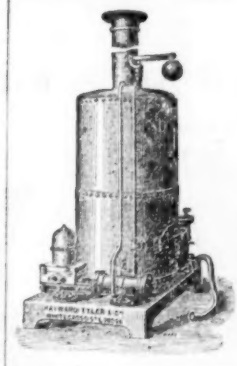

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HERBERTON (WILD RIVER) TIN LODES, NORTH QUEENSLAND.

Every information relative to the progress of lode-tin mining in the Wild River district (termed by geologists "The Cornwall of Australia") can be obtained by communicating with the undersigned. CHARLES JENKIN.

"Herberton Advertiser" Office Herberton, September, 1882.

MR. P. S. HAMILTON (late Chief Commissioner of Mines for the Province of Nova Scotia), PRACTICAL GEOLOGIST, MINING AGENT, and MINING ENGINEER, HALIFAX, NOVA SCOTIA.

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Original Correspondence.

SILVER MINING AND SMELTING—SUNNY CORNER, NEW SOUTH WALES.

SIR,—An event of the highest importance to the future prosperity of the mining industry of New South Wales and other Australian colonies has been lately chronicled in the *Sydney Morning Herald* (Dec. 22) in reference to the completion of the first silver refinery in Australia. There is a confirmation of the success of the undertaking in the announcement in your last issue, stating Messrs. Christopher Newton Bros. and Company had received advices of the shipment per P. and O. steamer Indus of 2 tons of silver bars from the Sunny Corner Mines, being the first result of this new and important adjunct to Australian mining. Two tons of silver bars from the first operations of the new smelting-works erected on an Australian silver mine is likely to cause some sensation not only amongst mining investors but financiers and others interested in the supply of the precious metals.

The Sunny Corner Company, which has for some time been steadily developing the resources of this newly found treasure, has been the first to receive upon its works the first complete set of appliances required for the reduction of silver from its native state to the condition of bankable bullion. The rapidity and efficiency with which the plant for smelting and refining has been established is in keeping with the great stride which the mining industry took in this district on the discovery of silver ore in large quantities.

On the successful starting of the smelting-works the customary inauguration banquet followed. Amongst the visitors and shareholders present were—Messrs. Sutherland and S. Smith, Ms.L.A., Messrs. John Newton, Geo. Bradley, Moxham, Walter Hall, Charles Kalbo, R. Prenderfast, T. F. Thompson, Stirling, Hutchinson, M'Donald, Bennet, and W. P. Read, Traffic Manager New South Wales Railway, Mr. Harrie Wood (Under Secretary of Mines), Mr. C. S. Wilkinson (Government Geologist), and Mr. E. F. Pitman (Chief Mining Surveyor).

In giving a description of the Sunny Corner Mine, Mr. William Hurley, the manager, said it had been the policy of the company "to find out that they had the grain in the barn before they brought the thrasher. They had enough to guarantee that where they could deliver 10 tons to-day they could deliver 500 tons next year. This proved that they had the grain in the barn, and in sufficient value to justify the Government in making a railway. The rapidity with which the Sunny Corner Mine had been worked up was evidence of the way in which the previously unknown resources of the country can be developed. The presence of silver in this district had not been ascertained until a comparatively recent period, and it was even now disregarded in many parts of the country."

A company has been formed for the manufacture and erection of smelting works under the title of the New South Wales and Queensland Manufacturing Company. This company have made arrangement for the erection of the smelting works with the Sunny Corner Company on a basis of payment by results, the plant being guaranteed to give 90 per cent. of the assay value, and the smelters to receive a royalty of 4s. per ton of ore put through for three years. These terms were given by the smelters when they had satisfied themselves as to the capabilities of the mines, and they are prepared to undertake the smelting of ores for any mine under similar conditions. This gives the owners of mines an immediate means of developing their property, and the results of the trial at the Sunny Corner Works have been awaited with deep interest.

The value of the important discoveries of silver ores in such large quantities and so rich in quality at the Sunny Corner district, in the central portion of the colony, and again on the Barrier ranges near the South Australian border, and at Boorook in the New England district in the north-eastern point of the colony, is an event, the full import of which can scarcely be recognised by those who may have only given a casual attention to the news.

Next to the discoveries of gold in Australia, the discovery and rapid development of the rich silver mines in three different districts so widely separated as those mentioned will create for New South Wales one of the most important epochs of its natural history. It will, like the States of Nevada and Colorado, be able to pour forth a stream of silver that will enrich the colony for all times as those States have done for America.

Unfortunately for the prosperity and development of mining in New South Wales there has been great lack of energy on behalf of the general community in giving encouragement to mining, and the greater portion of the prospecting and development has been carried on by or inaugurated through enterprising men from other colonies, mostly Victorians, whose restless energy after gold and silver knows no bounds, for after developing their own gold fields they sent forth prospectors and explorers to New South Wales, Queensland, New Zealand, Tasmania, Northern Territory, and other parts of the world.

The production of 2 tons of silver from the first results of smelting operations is an event of so startling a character that it can but give an immense impetus to mining generally, and lay the foundation of a career of prosperity for the colony that nothing can check. With the view of enabling the miners to have their ores reduced in the colony, thereby doing away with the necessity of sending them to England, as well as providing for the requirements of properties that cannot employ a full plant, the company is arranging for the erection of smelting-works near Sydney. These works will be fitted out in the most complete manner, and are to be adapted for the treatment of any ore that may be found in Australasia. The completion of such an establishment would undoubtedly give a strong impetus to the whole mining life of the colonies. It may be regarded as affording another gratifying phase of colonial industry that the machinery and plant used by the smelting company are manufactured by colonial firms.

The process of reduction as carried on at the Sunny Corner Mine is as follows:—"The ore is brought from the mine in various forms, and more or less refractory, some requiring to be roasted, while others can be put into the smelting furnace at once. It is intended to add to the appliances already obtained by the erection of a roaster. When passed directly into the smelting-works the particles which are exceptionally large, such as of 6 in. in diameter, are sent through a crusher and reduced to the size of roast metal. The ores so crushed are those which are not so refractory as to render it necessary for the smelter to desulphurise by a desulphurising process. They are fed directly into the furnace with fuel and fluxes. As the slag is being tapped from the furnace in front the lead, silver, and gold bullion flows from a syphon at the side, and is pailed into moulds holding about 90 lbs. each. This part of the process is worthy of some attention, as it involves an important improvement in the construction of the furnace, and that is that the water used for cooling the furnace is applied continuously over and over again with no perceptible waste, and the only actual consumption of water is in the evolution of steam, which is of course necessary under the circumstances."

When a quantity of about 3000 or 4000 ozs. of silver has accumulated on the bottom of the cupel it is pailed off, and become what are termed "concentrations," which contain 60 to 80 per cent. silver and gold and the balance of lead. When about 4000 to 6000 ozs. of silver and gold concentrations have been collected, they are placed in the same cupelling furnace, and when run "low down"—that is, the lead being principally taken out of the charge in the furnace—it is then cupelled in the mass, the balance of the lead being drawn off and the precious metals precipitated, and eventually tapped through the bottom of the furnace in a refined state. The silver and gold bars then formed weigh 1200 to 1400 ozs. The product is assayed, and the respective values of the metals are stamped on the bars, which are then ready for the Bank or Mint.

Mr. Lamont and Mr. Kahlo had such confidence in the Sunny Corner Mine that they undertook the erection of a furnace without receiving payment until the first bullion was turned out.

Mr. Lamont said it was one of the most promising districts it had ever been his lot to visit. He found ore in abundance, and its assay was fully equal to that of the large bonanza mines discovered and opened and worked in America for years. He thought the people of New South Wales were not aware of the importance of the industry that was being started at Sunny Corner. Mr. Kahlo expressed satisfaction at being associated with Mr. Lamont in the smelting enterprise, and that he intended making this undertaking his business. Mr. Newton said that the Sunny Corner Works had started from a small beginning. They first sent 10 tons of ore to be treated, and obtained 95 per cent. The furnaces had done better than they expected.

Mr. Harrie Wood, Under Secretary for Mines, from what he had seen, was confirmed in the opinion he had already held that New South Wales would become one of the great silver-producing countries of the world. The colony was much indebted to the gentlemen who brought the smelters there. It appears the Messrs. Hall were the first to start the development of the silver mines of the colony on an extensive scale.

From the general description given of the prospects of the Sunny Corner Mine, and others opening in the district, and the most favourable results of the operations of the smelting-works erected on the mine, there is no doubt of the future stability and highly profitable results to be derived from silver mining and smelting in New South Wales, and that it will cause an infusion of energy to be given to the hitherto much neglected mining interest of that colony.

New South Wales has special facilities for the development of gold and silver mining, a salubrious and enjoyable climate, an extensive and rapidly extending railway system, and in many cases an abundance of coal, iron, copper, tin, and kerosene shale, &c., and large sections of country well supplied with wood and water. Altogether the mining prospects of New South Wales may be said to be never better than at the present time, and much attention will no doubt be immediately given to the development of its vast mineral wealth.

THOMAS CORNISH, M.E.,
Author of "Our Gold Supply: Its Effects on Finance, Trade, Commerce, and Industries."

SIR,—Silver has come to the front with us—almost as suddenly as gold did when first worked here—and it is very doubtful whether any mine in America can show greater indications of richness than some of our Silverton ores, with their 3000 to 5000 ozs. to the ton, veins on the surface, and good sized lodes of galena showing 60 per cent. of lead and from 50 up to several hundred ounces of silver per ton, whilst at our Sunny Corner Mines, although the yield per ton is much less, the great size of the lodes promises to make them some of the most easily-worked and profitable ores in the world, as the following directors' report to the fortunate shareholders in the leading mine there, goes to prove. The position of the Sunny Corner Silver Mining Company, (Limited), in whose operations considerable interest centres, is disclosed in the directors' report submitted to the shareholders, under date Sydney, Dec. 3. The following extracts will be deemed interesting:—"In submitting this report of the affairs of your company, your directors may state that your property will, in their opinion, be dividend-paying before the expiration of January of the coming year. The Pacific smelter, which was erected during the present year and successfully put in blast for the first time on Aug. 27 last, has since been running at intervals for 50 days, and the result has been a return of 37,370 ozs. of silver and 188 ozs. of gold (now at the mine), valued at 918*l*. This furnace has hitherto been worked at a great disadvantage, consequent on a want of additional appliances to carry off the arsenical and lead fumes that have affected the workmen injuriously. The required additions have now been completed, and the furnace will be again put in blast on Thursday next, 4th instant. The nominal capacity of the furnace is 25 tons of ore per day, and this quantity has on occasions been slightly exceeded, while, with all the recent additions to the plant, it is confidently expected that this smelter may be now kept continuously at work. On Oct. 29 five stamps of the 10-stamper battery recently erected were got to work, and on Nov. 26 the 10-stampers were set in motion. The crushing shows satisfactory results, as the estimated value of amalgam is now 700*l*., while the tailings from the battery show an assay at the rate of 90 ozs. of silver and 6 dwts. of gold per ton. The Probert smelter and its adjuncts are almost completed and it is confidently expected that this extensive plant will be set in motion within 10 days from date. Its capacity is set down at 65 tons per day, and it is thought it cannot fall much short of this estimate. [Actual trial has shown 72 tons to 75 tons per day, the yield exceeding the estimate.] Putting the capacity of the Probert smelter at 60 tons per day, the Pacific smelter at 20 tons per day, and the average yield of silver at 50 ozs per ton (a very fair estimate), excluding value of gold, which has in the Pacific smelter averaged, say, 3½ dwts., or equal to 14s. per ton of ore, we will obtain a daily result of equal to 4000 ozs of silver, which, at, say, 4s. 6d. per oz., gives 900*l*., and gold at 14s. per ton of ore, 56*l*.; and this, with continuous running of smelters equal to 80 tons per day, would mean a product of gold and silver equal to 348,940*l*. per annum. These figures do not take into account the returns from the battery, which is kept continuously at work, and may be estimated to return in the form of bullion not less than 120*l*. per week, leaving the tailings available for smelting. By the last assay of tailings from the battery, as above stated, they contained 90 ozs. of silver and 6 dwts. of gold, worth, say, 21*l*. per ton. As to cost of smelting, by the terms of our contract with Messrs. La Monte and Rosener, they covenant to smelt 25 per cent. of ore and 75 per cent. of tailings at 24s. per ton for a run of 90 days; and while your directors are of opinion that the actual cost must exceed this amount, they are satisfied that within a short period the actual costs will, with experience, be brought within a limit that must give satisfactory results to all concerned. The most important fact as affecting the present and future value of the mine, is the quantity of payable ore already 'won,' and ready for treatment; and on this point your directors, while they cannot formulate or even approximate the quantity, can give satisfactory assurance. Mr. E. S. Nixon, mining surveyor, recently in charge of the underground surveys of the Great Cobar Copper Mine, has been engaged to effect a complete survey of the workings of your mine. He has only been engaged on the work for about five weeks and is not yet prepared to give an estimate of ore 'won' and in sight, but putting the ore to be furnaced at 80 tons per day, or 29,200 tons per annum, he is of opinion that the ore now stacked and in sight is at least three years ahead of the present capacity of our smelting power, and this is quite irrespective of the fact that your directors are vigorously pushing on the further development of the mine, and do not intend to relax the opening up of the various lodes, which show no sign of diminution. Instructions have been given to Mr. Nixon to prepare, in conjunction with Mr. Hurley, the mine manager, when the underground surveys of the mine have been completed, a full report of the work done in opening the mine, the ore that has been 'won' and in sight, the prospects and development. This report, when obtained, will be at once printed, and placed in the hands of the shareholders. Your directors are fully alive to the necessity of providing further smelting power when the time arrives, which cannot be but in the near future."

Of course the above vaticinations have yet to be proved, but experts who have visited the workings, seem to think them fairly warranted, and the shareholders themselves back their own opinion by holding their shares, although 6*l*. is freely offered for the 1*l*. ones.

Sydney, Dec. R. D. A.

LARGE YIELDS FROM QUEENSLAND MINES.

SIR,—At Charters Towers the Day Dawn has maintained its premier position. The half-yearly meeting disclosed the fact that during the six months 5613 tons of quartz were treated, for a yield of 15,061 ozs. 9 dwts. 12 grs. of smelted gold, being an average of 2 ozs. 13 dwts. 15 grs. per ton. The amount paid in dividends was 37,200*l*. The total quantity of stone crushed from September, 1878, to Oct. 8, 1884, was 41,944 tons, yielding 98,365 ozs., valued at 330,183*l*. 13s. 2d. Dividends paid, 206,799*l*. 8s. As a proof that the other claims on the field have done well, the following may be quoted:—A crushing of 493 tons from No. 6 North Queen Company yielded 2150 ozs. of gold. A dividend of 4s. 6d. per share was declared. The Mosman Company cleaned up for 461 ozs. 9 dwts. of gold. The Day Dawn Block and Wyndham Company crushed for the fortnight ending Oct. 14, 401 tons, yielding 714 ozs. of gold. A dividend of 1s. per share was declared. During the next fortnight they crushed 347 tons for 608 ozs. of gold. A dividend of 1s. 6d. was declared.

Mr. E. D. Miles, Charters Towers, forwards the following fortnightly mining report, under date Nov. 7:—

Day Dawn P.C.—The mill has been running continuously during the fortnight with 30 heads: 770 tons of stone have been crushed for a yield of 2099 ozs. 3 dwts. of smelted gold. The mine is still looking well. A dividend, the 73rd, of 5s. per 24,000th share has been paid.

Charters Towers.—Nov. 15: The following crushings have been cleaned up:—Queen No. 2 south-west, 850 tons for 1600 ozs. gold. The grindings will bring the yield up to 2 ozs. per ton. Little Wonder, 6 tons for 26 ozs. St. George p.c., 117 tons for 380 ozs.

The gold purchased by the banks during the past ten months amounts to 94,000 ozs. The total yield for the year is likely to be 120,000 ozs.

Nov. 17.—The Day Dawn p.c. company have cleaned up a fortnight's crushing for 1789 ozs. gold.

Nov. 18.—The following crushings have been cleaned up:—North Star, 83 tons for a yield of 157 ozs. 19 dwts. gold; Rise and Shine, 96 ozs. 4 dwts.; Wanderer, 6 tons for 26 ozs. 3 dwts.; Rolberg and party, Rishton, 15 ozs. 17 dwts.; No. 2 Queen, 780 ozs.; Bluff, 16 ozs.; Broughton, 10 ozs.; Day Dawn p.c., 1788 ozs. for a fortnight's crushing. A dividend of 4s. per 24,000th share has been declared by the latter company. During the past week the local banks have purchased 1544 ozs. gold.

Advices from Gympie, dated Dec. 5, report that the several mining companies are making good progress with work. No. 1 South Wilmot Gold Mining Company crushed 151 tons quartz for a yield of 1026 ozs. 19 dwts. smelted gold. No. 708 South Monkland, 239 tons quartz; yield, 143 ozs. 5 dwts.—Dec. 8. A crushing from 52 tons from No. 1 South Alliance, 59½ ozs. gold. Nos. 2 and 3 Smithfield, 437 tons; yield, 401 ozs. gold. Phœnix Prospectors, 655 tons; yield, 341½ ozs. gold. Nos. 7 and 8 Monkland, 239 tons; yield, 147 ozs. gold. A miner galloped into Gladstone from Mount Redshirt Upper Calliope, to secure the registration of a claim on a newly-discovered reef, a small trial crushing giving a return at the rate of 13 ozs. per ton. Other claims are also taken up, and a rush to the new field will no doubt ensue. The Ellen Hawkins Company declared a dividend of 1350*l*. from the proceeds of washing up at the Victoria mill.

Later reports to Dec. 9, 1884, from Charters Towers, state that the Day Dawn and Wyndham Company have crushed for the fortnight 425 tons stone; yield, 587 ozs. gold. No. 6 North Queen, from a second washing up, have obtained 1004 ozs. gold. A dividend of 2s. per share was declared. The following crushings have also been cleaned up:—Phœbe Company, 120 tons for 250 ozs.; Hope Company, 271 tons for 300 ozs.; Nitth's St. Patrick tribute, 540 tons for 93 ozs.; Carroll's St. Patrick tribute, 42 tons for 93 ozs. The Lady Maria Company crushed 86 tons; yield, 371 ozs., and about 20 ozs. more expected from the grindings. THOMAS CORNISH, M.E.

WILD RIVER, NORTH QUEENSLAND.

SIR,—Heavy rains have continued since my last, which have allowed stream tinners to sluice their wash-dirt. The price this tin realises here is 36*l*. per ton, and the quantity in the district at the moment is over 150 tons. This quantity is, of course, irrespective of dressed tin, and it is computed that the value of the tin exported from this district during the current year has been over 160,000*l*., notwithstanding the reduced price of the article. This much has been effected despite many drawbacks, the principal one being the lowness of the price of tin in London, preventing working miners doing any good for themselves, and compelling to register or abandon their claims. When the price was between 80*l*. and 90*l*. working miners could earn fair wages from what tin they raised, but the present declension does not afford them "tucker." Companies with capital can carry on profitably at present rates as they are doing.

Since my last, however, payable gold has been declared by seven Chinamen about the Johnston river, of which but few know the exact whereabouts, although it is new country between Minilyan harbour, the Johnston river, and may be this town. The fact of its being a *terra incognita* does not prevent a rush, and while the people are flocking there from the south, every man who can get away will leave, taking no account of the difficulties and dangers that are insuperable in a dense virgin scrub, particularly during the rains, when the malarious vapours are dense and malignant. Miners have no fear of these matters when gold is to be attained; nor do they give a second thought about where they are to procure rations when those they have to carry are exhausted. Gold is the charm, and the miner has to follow it; hence the mining population here may, for some time, be considerably diminished. There is also the probability of gold or tin discoveries being made between the locality of the present rush and Herberton, and prospecting will be carried on vigorously. It is all virgin country, but a track has been travelled over by a few. If it be verified that this find is payable it will afford another proof of the richness of Northern Queensland in all metals and minerals.

With regard to tin, I am often surprised when reading your valuable paper of the vast differences in the percentages of tin ore produced at Cornwall and that raised here. The average percentage of the ore of this district is very fair, whilst some of it ranges wonderfully high. This in itself is encouraging to speculators, who are the people required here to develope the finest mineral country in the world, where the profitable investment of capital is ensured, not alone by the quantity and quality of the various materials, but by commercial honesty, which is a characteristic of British miners. North Queensland, as a future locality for English investments, is bound to become the choice of speculators, especially in mining interests, now that the Torres Straits steamers have become a success. The millions of pounds that have been wastefully expended on foreign mines with foreign names, for which no returns have been made or ever will, will be the means of turning the attention of English capitalists to this remarkably prolific mineral field, where there is a guarantee of a return of their outlay with dividends that will be realised in lieu of being promised.

Herberton, Dec. 27. EDWARD MYERS.

IMPROVEMENTS IN TIN DRESSING.

SIR,—In the report from Cornwall last week I notice that, although propositions had been made for the introduction of machinery for the more economical and effectual separation of the metal from foreign substances, had been referred to, but not introduced, I beg to say that experience has taught me the extreme difficulty of introducing anything into Cornwall which may be termed a novelty.

I venture, however, to ask you to insert this letter, which may be reserved as a memento to the folly of the one who writes it (or otherwise), and it is satisfactory to know that the time is not far distant when shareholder in mines, committees, and even captains of mines themselves, will have seriously to consider the cheapest means of dressing, as well as the best means of saving the ore from being washed away from the respective mines into the sea, or to be partly rescued at no profit to the shareholders, who have paid for raising as well as crushing the same.

To abolish for ever the system of using strips, buddles, and slime pits would be an innovation which to many would appear to be impractible, and that no flushing of buddles, or shovel, or spade, and wheelbarrow work is at all necessary may appear incredible.

That three times the amount of space required for floors on the present system, too, to that really required, is hard to be believed, and that one moiety of cost in dressing and a larger percentage of waste saved is a matter to be discussed and proved, if possible. A machine, however, has been patented, which it is claimed will accomplish the objects above referred to, and the first object in view by its use is the disposal of the light slime by overflow-tanks, the whole of the ore being tossed and washed under such a volume of water as may be necessary, according to the nature of the foreign matter in which the mineral is found. Appliances simple in their construction are provided to keep these tanks continuously clear, and to place without hand labour the same into suitable receivers for dividing the fine

ore from the rough sand, each to be treated afterwards as may be deemed best. Up to this stage of dressing no hand labour is required after leaving the crusher, and the machinery required is simple and inexpensive.

It is a matter of doubt if the old system of stamps, with its cumbrous appliances, can be much longer maintained, the same being substituted by crushers, pulverisers, or other appliances. The great competition in the production of metal of all kinds, as well as every other commodity in use, renders the adoption of economical appliances absolutely necessary, ir deed imperative, and an invention which will save even one-half of the wretched amount of waste now going on at our mines should be adopted without delay. Any of your readers desirous of communicating with the writer on the subject may do so personally, or if desired, through the columns of your valuable Journal. THOMAS VOSPER.

22, *Stoke Newington-road, N., Feb.* 16.

THE RESOURCES OF NORTH CAROLINA.

SIR,—During the autumn of 1883 I sent you several papers on the above-named subject. They were the result of personal examination, or from authentic sources. It is impossible for anyone who has not visited the State to have any idea of what it might be if it were possible to make the best of its wealth. Previous to the discovery of gold in California in 1848, and in Australia in 1851, North Carolina produced the largest nugget of gold ever found. It weighed 28 lbs. The richest specimen of gold I have ever seen for purity was found there, and it was sold at the United States Mint at Charlotte for more than $20 per oz. Its only alloy being 1d. worth of silver in each ounce of gold. I have seen wheat there that weighed 69 lbs. per bushel. It was not uncommon to see poplar trees over 9 ft. diameter. In the winter of 1883 there were over 35,000 oak railway sleepers at the Thomasville Railway Station, not one of which had cost more than 1s. 3d. Shuttle blocks of dog wood and persimon are sent thence by the million, and it was not uncommon for over 200,000 staves for barrels to be sent from Thomasville in a single day. These remarks have been called forth by the enclosed extract from to-day's *Daily Telegraph* in a letter from its correspondent about the New Orleans Exhibition:

North Carolina makes a brave show of minerals, including nearly 600 specimens of free milling and sulphide ores. In slates and building stones she is especially rich, but more striking to the ordinary observer are the number and variety of the gems within her borders. Precious stones of all kinds are profusely shown under the roof of a graceful pavilion, composed as to its exterior entirely of mica, and shining with a soft, silvery light that makes it an ex tremely beautiful object. The agricultural display of this State, with its wealth of grains, fruit, and fibres, is such as might be expected, but the world hardly associates North Carolina with eminence in fishing. Nevertheless she makes the finest exhibition in that line of industry that the building contains; next after that of the Federal Government. She obtains from her fisheries more than $1,000,000 yearly, and the array of tackle, boats, &c., on view conclusively proves that her coast people are "up with the times." From the forests of this State come a large number of specimen woods, including a section of a poplar which, hollowed out, is used as an office.

In 1883, at the Exhibition at Boston, North Carolina was the most celebrated of all the States for its metals, minerals, timber, and agricultural produce. But how can the best be made of a fertile district nearly as large as England and Wales by a population that does not reach 1,500,000. Besides these advantages it has the finest and most abundant water-power on the American continent. All this is within 10 days of England. HENRY MOON.

92, *St. Paul's-road, N., Feb.* 19.

CAN A MINE BE WORKED BY ELECTRICITY?

SIR,—A friend of mine is working a mine in a mountain ravine and wishes to go on and develope it thoroughly, but the ravine referred to does not carry sufficient water by a great deal to give him the necessary power for pumping, winding, and crushing. In an adjoining ravine, or in one over the mountain about 2 miles away, there is an abundant supply of water equal to drive very large machinery. He has an idea of utilising this power to work machinery for producing electricity, and to send it by wire rope to his own mine, and supply him with the power to enable him to work his mine. He, like myself, has not sufficient knowledge to guide us in this matter, and I thought some of your readers might be disposed to say if they thought it a feasible or practicable thing to do, or it may be those who make machinery might furnish me with every information which might probably lead to a contract. I enclose my card. MINER.

EMPLOYMENT IN THE ENGINEERING TRADES.—The reports as to the condition of employment vary somewhat. A considerable improvement during the past month is reported in some cases, in others the condition of employment remains about stationary, whilst in many cases a continued increase in the number of members coming out of work is reported. The branch returns of the Amalgamated Society of Engineers for the Manchester and Salford districts show a very decided improvement, and there is a decrease of about 1 per cent. in the number of members in receipt of out-of-work donation as compared with a month ago. The improvement has been very marked in the demand for pattern-makers, of whom there are not one-third the number, and for smiths, of whom there is less than half the number on the books as compared with a month ago, and this would seem to indicate that there is a fair amount of work in preparation for the turners' and fitters' departments. Throughout other Lancashire districts there is, however, not any very marked improvement; the number of men out of work is, however, slightly on the decrease, and the same may be said with regard to the various branches of the society throughout the country. Generally, the average number of members in receipt of out-of-work support throughout all the branches of the society being about 5 per cent., whilst for the Manchester and Salford districts it does not exceed 4 per cent. With regard to the general condition of trade, locomotive builders are reported to be fully employed everywhere, with most other branches fairly busy, the really serious drawback to trade being the continued depression in iron shipbuilding. In the report of the Steam-Engine Makers' Society it is stated that from the branch returns there would seem to have been a slight improvement in the marine engineering districts, and this had resulted in a decreased list of unemployed in these localities. On the other hand there was a perceptible decline in millwrighting work and in general engineering that had led to an increase in the number of members receiving donation. So far as could be seen there was not much hope held out for improvement in trade, whilst the complications which were now taking place in the political world would not tend to improve the position of trade, or that of the working classes generally. The number of members in receipt of out-of-work support is about 3½ per cent., which is a slight increase upon the returns for last month.

BENT COLLIERY COMPANY.—The Bent Colliery Company have reached the Ell coal seam in their Hamilton Palace Colliery, at a depth of 92 fms. Operations at Bothwell Haugh commenced about 18 months ago, and the difficulties anticipated to be encountered in sinking the pits have been overcome in a manner at once satisfactory to the colliery company and reflecting the highest credit upon the ability and energy of Mr. James S. Dixon, C. and M.E., managing partner, and Mr. Blyth, the works manager. This colliery is said to be the largest field in Lanarkshire, and machinery will be put up to produce an output of over 2000 tons daily.

AT an influential meeting of the Derbyshire, Nottinghamshire, Leicestershire, and Warwickshire Colliery Owners' Association, held at the Midland Hotel, Derby, on Tuesday last, petitions against the Bills deposited by the Midland, London and North-Western, and Great Northern Railway Companies were unanimously adopted and ordered to be signed by the Chairman, Mr. Alfred Barnes, M.P., on behalf of the association. The petitions were also signed by the leading coalowners of the Midland counties present at the meeting.

SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE INSTITUTE OF MINING ENGINEERS.

EIGHTEENTH ANNUAL MEETING.

The above meeting was held at the Mining Museum, Dudley, on Monday last, Mr. A. SOPWITH, M.Inst.C.E., the retiring President, occupying the chair, and Professor BROWN, M.Inst.C.E., the President-elect, the vice-chair. After the usual formal business, the secretary, MR. ALEXANDER SMITH, M.Inst.C.E., read the following report of the Council:—

GENTLEMEN,—The Council regret they cannot preface this their eighteenth annual report, with congratulations upon any improvement in the important branches of trade upon which depend the vitality of this immediate locality which affect you individually, and of course indirectly have a material effect upon the condition of the Institute. The consequence is that the past year has not been a prosperous one, and there are 10 members less than in 1883; five have resigned, two are dead (Messrs. H. Mason and Geo. Thomas), four have gone from the neighbourhood leaving no address, and only one new member has been elected, so that the total number on the list is 169.

After some details as to the funds the report states:—The bank balance stands at 306*l.* 14s. 9d., which, with the subscriptions due Dec. 31 last—226*l.* 16s.—makes your total assets 533*l.* 10s. 9d., or 18s. 8d. less than the previous year, and no credit is taken for considerably more than 100*l.* worth of property in the Mining Museum.

Nine general and six council meetings have been held, and there was an interesting excursion made, in conjunction with the Chesterfield and Derbyshire Institute, to Birmingham and the Black Country. The whole matter was organised and the arrangements carried out hy the officials of this Institute, under the presidency of Lord Edward Cavendish. The members of the sister Institute were exceedingly gratified by the proceedings, and they have graciously tendered, through their Council, their hearty thanks, and they have also kindly presented 300 copies of the map of this district which accompanied the programme to be bound up in your Transactions.

Several interesting papers have been read and discussed at the meetings, and an excellent geological lecture was given in December last by Prof. Jones, F.R.S. The Council last year determined that all the Transactions should be published to date as soon as possible, and two volumes have been issued; the third, bringing up the whole of the arrears, is nearly ready, and would have been published some time since, had not considerable delay been caused by the transfer of the printer's business, and alterations to his premises. For the first time in the history of the Institute you will miss from the annual gathering our old and respected friend Mr. Henry Johnson, sen., who has undergone a severe surgical operation, and makes but slow progress towards recovery. He was, as you all know, one of the founders, and the first secretary of the Institute, and has devoted more time and attention to its interest than any other person, scarcely ever being absent from its meetings. The Council are certain that you join with them in sincere and heartfelt sympathy, and the strongest wishes that he may yet be spared and restored to health, so that for years to come the Institute may benefit by his counsel and advice. In conclusion, the Council would urge upon each member the necessity for individual effort in furthering the objects of the Institue, by reading papers, and bringing forward matters of interest, and also by inducing those who are qualified to join the Institute.

The report and balance-sheet was adopted, and the scrutineers' report showed that Mr. Brown was elected President, Mr. W. B. Scott Vice-President, Mr. Latham treasurer, Mr. Alexander Smith secretary, and Messrs. Collis, E. B. Martin, S. Watkin, J. H. Cooksey, and T. Oakes new members of Council. Mr. BROWN then took the chair, and read the following address:—

Prof. JOHN BROWN, M.Inst. C.E., in his inaugural address, said: I have to thank the members of this Institute for the mark of confidence and respect they have paid me by electing me their President. I regret that a severe attack of illness has prevented me from giving that attention to the subject matter of this address which the importance of the Institute deserved, but I will endeavour to glance at the more interesting of the questions that are occupying the consideration of the mining community at the present day. Before, however, proceeding with these there are two subjects to which I must ask your attention for a few moments. The first is one which must call forth the heartfelt grief of every member of the Institute, and must occasion much sorrow to his many personal friends; I allude to the severe illness which has stricken down our old and much esteemed colleague, Mr. Henry Johnson, and for whose speedy restoration to health we must all be so anxious. He was one of the founders of this Institute, and for many years worked most actively and zealously for its advancement, first in the capacity of lecturer, and then twice as junior President. He is a man who could be ill-spared from our midst, he has made his mark in this district, and is well known in other coal fields.

"Westbromwich, Feb. 15, 1885.

"Dear Mr. Brown,—I regret domestic affliction will preclude my being with you at the annual meeting of the Mining Institute on Monday next, and at which I have the pleasure of knowing you will preside. You will be glad to know that my father is now making more satisfactory progress towards convalescence from his very serious illness, the result of the operation he has undergone for sciatica.—With best wishes for a successful meeting, believe me, yours sincerely, "HY. JOHNSON, Jun.

"John Brown, Esq."

The second subject is a personal one as regards myself, and I must ask you not to consider me too egotistical by mentioning it; which I do, as I wish to show the full sense of gratitude I feel towards the Institute. It is in reference to my present connection with the Mason Science College, and which has been mentioned in your Transactions for Oct. 1, 1883. But I wish to make a few more remarks in addition to a letter of mine to your secretary, dated Sept. 8, 1883, and which appears in the Transactions for that year. Shortly, I wish to be distinctly understood that my acceptance of the very responsible duties of lecturing upon mining at the College entirely arose from my being assured that this Institute of Mining Engineers would view my appointment with satisfaction. When I was first consulted about the establishment of mining lectures, I recommended a gentleman as lecturer, assuring the authorities that I could not accept the appointment myself, as my heavy professional engagements upon arbitrations and other matters would inevitably entail my absence from Birmingham at times when it had been announced that I was to lecture; I explained that this appeared to me to be an insuperable difficulty; but I gave way upon hearing the following argument:—1, That, as I have just stated, my acceptance would be satisfactory to this Institute; 2, that the College authorities had no funds to enable them to offer a stipend at present to anyone lecturing on mining, and that if I did not undertake the duties as a friend of mining education the scheme must remain in abeyance for a time; 3, that if I had professional engagements which I could not defer, it would be satisfactory if I announced to the College in time to send out post cards to the students to prevent their attendance until another day, I may remark that it has turned out exactly as I had predicted and explained—that urgent engagements many miles away have prevented the regular delivery of lectures on each consecutive Monday, and must of course have occasioned some disappointment and inconvenience to the students. The result, however, during the spring and summer terms of 1884—from January to June—was, that instead of giving 20 lectures of one hour each, I gave lectures equal in number and time to rather more than 30 lectures of one hour each. My recent illness, which confined me to bed, and prevented me for many days from doing any kind of work, has interfered with the regular course of lectures as announced for the present term, but I hope to be able to make the best amends I can to the students before the close of the summer term in June. I may remark that I have been more anxious to make the lectures a success, and have worked harder than if I had been in receipt of a stiped. I do not regret my acceptance of the duties, but I must candidly admit that had I foreseen the labour required, and the interference with my professional engagements, I should not have accepted the responsibilities. My duties at the College must plead my excuse for not attending your meetings as I could have wished to have done, since you honoured me by my appointment as vice-president a year ago. Having accepted now the still more responsible duties of President, I intend to make such arrangements as will enable me to attend as regularly as I possibly can, to preside over your meetings, and to which duty I look forward to with great pleasure. In order to enable me to carry out the programme I have laid down, and also to fulfil my engagements at the College and with the Institute, as far as practicable, I trust you will allow the meetings to be held at Birmingham, instead of Dudley. I have no positive authority from the College to say that permission will be given to have the meetings there, but I understood that it will be so. My days are fixed there for Mondays, and that happens also to be the day on which your Institute meetings are held once a month, and if the members would take into their serious consideration what I have asked, they would help me considerably in my position, by meeting at Birmingham, instead of at Dudley, if it can be possibly arranged. I greatly regret, as you must all do, that at the commencement of another year of the life of this Institute the prospects of the coal and iron trade continue so gloomy. The struggle against bad times, the continuance of which for so long a period is without precedent, has been a most severe tax upon the financial resources of the proprietors, and upon the energies and intellectual resources of the mining engineers and managers; and has pressed heavily upon the workmen; and most Institutes like ours have sustained losses in members and in funds, but I think we may confidently expect an improvement in our position whenever there is a revival in the trade of this and other districts. Our library and museum require support, and bad as the times are I cannot but think that if each member of our Institute would devoutly consider what he could do to augment our stock of books and objects of mining and mechanical interest, he might render substantial help without inflicting too great a tax upon himself. Every book or pamphlet added to the library, and every object added to the museum, will not only tend to increase our stock, but will prove an earnest of the sincerity of the members' wishes for the prosperity of the Institute. My immediate predecessor in the presidential chair called your attention a year ago to there being a "dearth of original papers" read to the Institute; and I now feel it to be my imperative duty to again bring the matter before you, and to invite your most earnest attention to the vital necessity of not trusting too much to papers descriptive of invention, which have been or will be also read to other Institutes; but that our ordinary meetings should be mainly occupied in the reading of papers prepared by our own members and in the discussion of them. Surely in a district like that of ours, so full of an interesting matter of a mining and mechanical kind, there must be subjects that can be presented for information and discussion by scores of members who have not as yet aided us by means of papers. It is not necessary that these papers be long and elaborate; and I cannot but believe that each member knows something that is not known at all, or so well to his fellow members as to himself, and which would increase the general stock of knowledge if laid before us, and would tend, in a remarkable manner to promote the success of the Institute. I trust that the younger members especially will take this to heart, and will feel that the monthly meetings of the Institute are not to be merely a gathering to listen to long papers or dissertations by a lecturer, but to be meetings where each person of an observant character can and *ought* to contribute in some measure to the information of his fellow members. Let me urge upon our young members never to become possessed of an acquaintance with facts new to him without carefully recording, for future reference, all the circumstances attendant upon such acquaintance, and if he become aware of an *effect* which he does not quite understand not to let the enquiry rest until he has ascertained the *cause*. In the present depressed days it behoves those who have the control of the expenditure of money not to incur any outlay that can be properly and safely avoided, but if a manager feels and knows that safety to his workmen requires something to be done, do not let him think twice as to having it done, and done effectually. In calling the attention of our members to various improvements in many appliances, and to important works accomplished during the past few years, I shall, I have no doubt, have to repeat something or other which is more or less familiar to you all, and which may have been desoribed already in your Transactions; but at the risk of some such repetition I will mention what it has appeared to me desirable to bring forward.

Boring.—The old process of boring by rigid iron rods, by hand labour, has been improved upon in various ways. By free falling tools, without the full impetus of the rods, which has enabled Mr. King and others to bore to a depth of from 3000 to more than 4000 ft. The Americans have largely used the Chinese old method of boring by round ropes, and have bored holes very rapidly and at little cost; for instance, a depth of 500 yards has been bored in little more than a month, and at a cost of less than 10s. per foot. Mather and Platt have by their flat rope arrangement successfully bored deep holes and extracted cores. The diamond boring arrangements by Colonel Beaumont and other inventors, are well known, and a depth of about 4000 ft. has been attained, and perfect cores extracted from some kinds of strata. The Danish system of hollow rods, down which water is forced, so bringing up the debris to the surface outside the rods, has accomplished rapid work in deep holes. Recently complaints have been made as to the very great lateral deviation from a true vertical line, which has occurred in deep holes; and this has led to several very ingenious inventions for ascertaining the direction (magnetic) of the hole, and the amount of each deviation.

Winding Engines.—The great depth from which it is now required to raise coal, and the large quantities to be drawn in the short time available per day, has necessitated the introduction of very powerful machinery, and we have some excellent examples at Sandwell and Hamstead Collieries, in our own district. Various attempts at counterbalancing the weight of ropes in deep shafts have been made: for instance, by spiral or "scroll" drum, and by "conical" drums. Round ropes have also been used on Lancashire coiling upon themselves in grooves similar to flat ropes. The Koepe mode of winding adopted at Bestwood Colliery, in Nottingham, with a balance rope fixed underneath the cage, has recently, I see, been put to work at the Sneyd Colliery, in North Staffordshire, and is well worthy of attention.

Ropes.—I wish to call attention here to what I cannot but consider a great blot on mining practice,—the attempt by makers to produce low-priced steel ropes—ropes at such prices as it is quite impossible for the article described to be produced in a genuine condition. I fear this must lead sooner or later to sad accidents. I consider that every mining engineer and colliery manager ought to set his face against such a dangerous and reprehensible practice as that of cutting down the cost and so deterioating the quality of such important articles as winding ropes. I have for some years expressed my strong objection to such practices.

Pumping Machinery.—Very great improvements have been effected in the last few years by the introduction of engines, affording great economy, and the fine example of Davey's compound differential engine, at Mr. Raybould's Bromley Colliery, is well worthy of careful study.

Shaft-Sinking.—The Kind-Chaudron system of sinking has proved very successful in the county of Durham, at the Whitburn Colliery, where the ordinary pumping arrangements had to contend with feeders of water coming directly from the sea, which could not be dealt with by pumping. Abont 12,000 gallons per minute were pumped at an enormous cost, but to no avail. The Kind-Chaudron system effectually overcame all difficulties. This mode was applied at the Cannock and Huntingdon Colliery, but before its adoption some mining engineer of great experience, and with whom I fully agreed, expressed an opinion that the water was such as ought to be satisfactorily dealt with by ordinary powerful pumping arrangements; and if the latter had been adopted, I am fully of opinion that the water-bearing shale would have been passed through at a much less cost than has been ineffectually incurred. One of the most recent inventions in aid of sinking through quicksands is that of Herr Poetech, and is accomplished by consolidating the saturated sand

by a freezing mixture chemically produced. I believe the process has been recently described to the Institute by Mr. Hughes, jun.

Coal Working.—I am of opinion that very interesting and instructive papers might be read upon the various systems of working, and other modifications as adopted in the district. The Thick coal working is of an exceptional character, and papers upon it would be very instructive to many of our members who are not engaged in it themselves.

Spontaneous Combustion.—This is a subject constantly before the minds of many of our members, and an interchange of ideas as to the facts in connection with gob-fires, and as to the probable causes, would prove very interesting and instructive. It was formerly held that the heating was occasioned by the chemical action produced by iron pyrites or sulphide of iron, but a consideration that the spontaneous heating occurred to a great extent in the Thick coal, which is a very pure coal, occasioned a change of opinion, and it is now generally believed that this chemical action is produced by oxidation of very small particles of coal, frequently produced in the cracks on a rib.

Safety Lamps.— No subject had occupied so much of the attention of mining men generally, for some years, as that of the invention of an efficient and thoroughly safe lamp. The Mueseler lamp, with various modifications, and the Marsaut lamp, are those best thought of now. I understand we shall have the Wolf lamp, the ingenious invention of Herr Wolf, of Zwiekan, described to us to-day. Attempts have been made to explode safety-lamps at such velocities, as to my mind, cannot ever occur in practice. I, therefore, venture to hope that there are lamps now known, which, for all, or almost without exception all practical purposes are safe when properly used. The great velocity produced in the different experiments, and which has caused the flame to fuse outside, can only occur, I think, by a sudden and violent fall in the roof, and this, I am of opinion, would not continue long enough to produce the effects caused by the experiments. We all ought to be very much obliged to the various lamp committees for the very valuable array of facts they have obtained ; but, as I have previously said, we must not consider all the lamps that have passed the flame, at an abnormal velocity, as being unsafe for practical use. We are expecting that the publication of the report of the Royal Commission on Accidents in Mines will furnish us with much valuable information as to safety-lamps, and various other matters in connection with the subjects they have been investigating.

Electric Light.—The lighting of coal mines by means of electricity has not made any practical way at present, and many great difficulties will have to be surmounted before it will be accomplished. A moveable electric light would require to be supplemented by a very portable apparatus of some kind for the ready and reliable detection of fire-damp. For fixed lights there is the risk of a spark arising from suddenly making or breaking contacts, the latter arising from such a fall of roof as would sever the wires.

Ventilation of Mines.—Economical and efficient ventilation is a desirable result. For ventilation of mines of moderate extent, and which are not of a "fiery" character, a well constructed furnace is sufficient, but for large areas of workings in seams likely to produce fire-damp in considerable quantities we must resort to mechanical ventilation. Various fans are in use, and producing good results. The Guibal and Waddle fans are largely adopted, and each has its supporters Space does not allow me to go into the question of their respective merits. I may, however, say that I have great faith in the Waddle fan, arising from its undoubted capabilities, and from its simplicity of construction, reducing cost of wear and tear to a minimum. The Rammel fan is in use at the Cannock Chase. The Schiele fan, of small diameter, driven at a rapid rate by means of bells, is doing good service in some districts. The Leeds fan is well spoken of in Yorkshire. The Cockson fan, a recent invention at Wigan, is said to be very efficient and reliable, and has been described to the Institute. The above are centrifugal fans, some close casted and some open running. Unfortunately I have not been able to attend any of the meetings when papers have been read or experiments conducted in reference to the Capell fan, I am therefore unable to give any opinion as to its merits, but I sincerely hope that it will prove full and fair trials at Hamstead and elsewhere. There are several kinds of displacement machines in use, such as Cooke's, Root's, and others. They have had their strong advocates, but so far as I can judge are not equal in efficiency to a well constructed fan. Distribution of air is a subject to be well studied, inasmuch as large ventilating power is of little practical avail if not accompanied by judicious distribution. Ascentional ventilation, especially in fiery and steep mines, should be adopted as far as practicable. Many ingenious and delicate instruments for the detection of firedamp have been fully described by Mr. Sopwith a year ago. I fear that some of them, however, are not of much value for practical daily use ; I have had them in mind, and called attention to them for several years. An interesting question is now being generally discussed as to the utility of "warnings" in newspapers to colliers in reference to the issue of firedamp. Chiefly because I am not desirous of saying one word against any reasonable and proper precautions I hardly like to object to these warnings being attended to by the readers of the newspapers containing them ; but plainly speaking I do not think them of any value ; indeed, in some measure they may tend to prove dangerous, as being intermittent in their teaching. I think that stringent observations and precautions should be made every day and every hour in a coal mine that has been proved to yield firedamp whether from the solid coal, from the grooves, or from sudden outbursts. It has, I consider, been sufficiently proved by many observers that gas issues in large quantities before any barometer can indicate a diminished pressure. Further, the issue of firedamp occurs at times with such enormous force that any possible change in atmospheric pressure bears no possible comparison with it, and it is, therefore, utterly impossible that such outbursts can have been brought about by diminished atmospheric pressure. At the same time, I say let the officers of the mine record and consider the effect of the changes in pressure and temperature, but I look upon a colliery that would be "fouled" by a slight change in pressure as possessing too little margin of safety. I would recommend those who have the opportunity to make observations with the barometer in the mines as far from the shaft as possible, comparing them with observations made on the surface, in order to ascertain if—as is supposed by many mining engineers—the change in pressure occurs sooner in the mine than upon the surface. Such observations will, of course, require to be made by careful and accurate observers with accurate instruments. The result of such experiments would provide material for most useful paper and discussions.

Coal Dust.—The effect of coal dust in a dry mine, with large ventilating currents, in promoting or in aggravating an explosion, appears now to be placed beyond all doubt. It ought to be studied by every mining engineer or colliery manager. The investigation of it has been dealt with in a most interesting and exhaustive manner by the Chesterfield Institute, and is described at much length and with references to all authorities in this country, upon the Continent, and in the United States. No. 10 volume is a large one, is entirely devoted to it, and will bear very careful study.

Cutting and Breaking Down Coal and Stone.—This subject alone will require the serious and almost undivided attention at times of a colliery manager. The indiscriminate and reckless use of gunpowder has, no doubt, caused many sad calamities. On the other hand I cannot—at present at all events—subscribe to the recommendation that all blasting shall be entirely done away with ; I think such a sweeping restriction would operate very harshly upon some proprietors. I have upon various occasions, publicly and otherwise, urged upon colliery managers to try seriously with how little blasting they could accomplish the object of economically and efficiently breaking down coal into a condition for sending out of the mine. I am thoroughly convinced that proper holing, a judicious arrangement of the line of the working fences, and the adoption of some of the well-known portable devices for wedging or detaching coal, would render a good deal of the blasting now carried out unnecessary and undesirable, taking into account the increased percentage in the production of round coal, and the reduction of small which would arise. If the members of this Institute would make up their minds to try such experiments and give us the benefit of their experience, I have but little doubt that a great deal will be accomplished towards the abolition of gunpowder, at all events I wish this subject would be soon taken up for serious discussion. Time will not admit of my going into any detail as to the various coal-cutting machines —hydraulic and pneumatic wedges, screw wedges, worked by hand, lime cartridges, &c.—but I can say, try with how little powder you can satisfactorily break down coal, taking into account cost on the one hand and improved yield of large coal (which is a most important item) on the other.

Shaft Arrangements.— Descriptions of the practical operation of these would prove of interest. Electric signals are now very generally applied in deep shafts and extensive underground workings.

Safety links, such as Ormerod's, King's and others, are much used, and appear to be of great utility, if properly applied, and kept constantly in proper order. Arrangements to facilitate the quick removal of pit tubs from cages. Mr. Wills, of the Rowley Station Colliery, has an arrangement for this purpose, which I have not seen at present. I beg to call attention to an arrangement devised by Mr. Fisher, the manager of the Clifton Colliery, near Nottingham, and in use there, which enables a rapid removal of the tubs in a most satisfactory manner.

Coke Making, Including Washing and Grinding Coal.—This subject does not demand such serious attention in South Staffordshire as in districts producing large quantities of caking coal, and this in consequence of the coals raised hereabouts not being of a caking character. The different schemes for grinding and washing the dirty coal of a caking quality, and the various modes of coking so as to produce the largest result in money for coke only, or for coke and the various bye-products combined, require a large amount of attention in certain districts, and are very complicated, involving much chemical knowledge, and very close observation.

Underground Haulage.—This, a very wide subject, embracing a knowledge of the best modes of compressing air (which is an important study), and the best modes of applying the power from steam or compressed air under various and varying conditions. Whether to run the ropes down the shaft and so convey the power underground. Whether to use endless ropes or endless chains, or main and tail ropes. Whether to run long trains at great speed, or single tubs at intervals on the rope or chain, and at speeds of about two or three miles per hour. Whether to use highly compressed air in small locomotives, as is adopted at the Earl of Durham's and at the Cannock and Rugeley Collieries. Here is a field for observation and experiments by our members which should result in papers and discussions of great value. I wish to take the opportunity of calling attention to Mr. Fisher's system of underground haulage and of friction clips for throwing into and out of gear without shock whilst the machinery is in motion. The whole is in use at Clifton Colliery, in Nottingham, and has won golden opinions and adoption in various parts of the country. The whole has been very elaborately described recently in the Transactions of the Chesterfield and Derbyshire Institute.

Working Plans.—I say a few words here on the importance of having most accurate surveys most carefully put upon paper; with a system of contour lines at every change of, say, from 5 or 10 feet accurately plotted. From my own experience I may say that I have frequently felt the serious want of such a record. One of our past Presidents, Mr. Henry Johnson jun., had devised a most ingenious and effective mode of recording the ventilation upon working plans, and it is most readily available for recording changes in the mode of coursing the air whenever such changes arise. I have now hastily touched upon the most important subjects that call for the attention of a consulting mining engineer or for a colliery manager, and I trust I have said enough to indicate the vast range of subjects, upon some of which I sincerely trust we may have some practical papers presented by our members before long. I will here call attention to a young Institute,—that of British mining students. It has done good work in the shape of interesting papers, and is well worthy of support.

Lastly—not because its importance is not great—but because last words are sometimes the more impressive, I wish to say a few here upon the Mines Regulations Act and Mining Inspection. I can well remember the arguments and discussions in the Houses of Parliament and amongst mining men which preceded the first Act for the inspection of mines which came into operation by the appointment of three inspectors, Messrs. Mathers Dunn, Joseph Dickinson, and Charles Morton in November, 1850. Mr. Dunn had supervision of the counties of Durham, Northumberland, and Cumberland, and the mining districts of Scotland. Mr. Dickinson of the counties of Stafford, Salop, Worcester, Lancaster, Chester, and of North Wales. Mr. Morton of the counties of York, Derby, Notts, Leicester, and Warwick. When we consider that inspection now requires the necessary vigilance of 12 Inspectors and 12 assistant Inspectors, it must seem to all of us very strange how three gentlemen could have entered on such colossal duties, although South Wales does not appear to have been included. Of course arrangements were soon made for additional Inspectors, their number being increased from time to time, but extending over a period of many years. I had hoped to have closely investigated the statistics of the result of inspections in our own district, but have unfortunately been prevented from doing more than enabled me to say a very few words upon the subject. I cannot find in a separate account the number of fatal accidents in the district given by Mr. Dickinson in his first report, dated June 30, 1851. Some of the succeeding reports by other inspectors we have North Staffordshire and Shropshire as well, and it was not until some years had elapsed that South Staffordshire and Worcestershire were given apart from other districts. Upon referring to the last published report by Mr. Scott, dated March 26, 1884, I find that he says in 1851 189 lives were lost in the mines in the district, and in 1883 it had been reduced to 59, that the average for the ten years ended 1883 was 50·9. I cannot find the returns of the number of tons raised, and of workmen employed in this district, in the years 1851 and in 1883; but it appears that in the entire kingdom 219 persons were employed for each death in 1851, and 488 persons for each death in 1882. These are very satisfactory results, and must prove most encouraging to the Inspectors in the pursuance of their arduous and responsible duties; and ought to serve as a great inducement to colliery managers to carry out the provisions of the Act of Parliament in an earnest spirit, with an anxious desire to promote the safety of their workmen, and to work in unison with the Inspectors, all which I beg most strongly to commend to those of our younger members who are just commencing the responsibilities of colliery management. I now beg to thank you for your patient attention to my remarks, and to express my anxious desire that this Institute may not lose anything in efficiency or dignity during my year of office.

THE LARGEST EMERALD IN THE WORLD.—An emerald, weighing 1 lb., has been found in the celebrated Muzo Emerald Mines, in the State of Boyaca, United States of Columbia. The largest specimen of the gem heretofore known to lapidaries is in the collection of the Duke of Devonshire, and weighs between 8 ozs. and 9 ozs. It came from a mine in the same neighbourhood.

WHAT it costs to open a mine in Sierra County, California, is illustrated in the Downieville *Tribune*, which estimates the working outlay of the Ruby Drift Gravel Mining Company from January, 1880, to April 1883, at $92,232. Nearly all of this money was expended before the mine began to yield a profit. The Savage Placer Mining Company, of the same county, has expended over $90,000, and have not yet reached the gravel channel.

A MINER named Walter Lake (31) was fatally injured at Messrs. Bolckow, Vaughan, and Co.'s Chaloner Mines, Guisborough, on Tuesday week. The deceased was filling a wagon with stone, when about 7 cwts. of stone fell upon him from the roof of the mine, which is about 12 ft. high, killing him instantly. The deceased's head was injured in a terrible manner, and his right leg was broken.

Messrs. Andrew Knowles and Sons (Limited) have declared a dividend of 1½ per cent. for the year 1884.

NORTH OF ENGLAND INSTITUTE OF MINING AND MECHANICAL ENGINEERS.

A general meeting of the members of the North of England Mining and Mechanical Engineers was held, on Saturday, in the Wood Memorial Hall, Newcastle-on-Tyne, Mr. JOHN DAGLISH, President, in the chair.

MANGANESE DEPOSIT.

Prof. LEBOUR communicated a paper by Mr. EDWARD HALSE, "On the Manganese Deposit of the Islet of San Pietro, Sardinia."

The following is an abstract :—

San Pietro is a small island to the south-west of Sardinia, with an excellent harbour—Carlo Forte—on its eastern coast, 6 miles from Porto Scuso, on the south-western Sardinian coast. There is a small private mineral line about 15 miles long leading from the port, by which the whole of the lead and zinc ores are brought to the port, from whence they are shipped to England, or other places on the Continent. The manganese mine is on the western coast, and consists of two concessions—Capo Rosso and Capo Becco—and of two "permissions of research," the whole covering nearly 2000 acres. The seam of manganese ore (black to brown) is of an average thickness of 1 ft., lying on a bed of soft whitish clay, containing fragments of trachyte, and forming the floor of the deposit ; above it is some 4 ft. 6 in. of jasper, above which again comes trachyte of various colours and qualities. Of the jasper, which seems to be found in considerable quantities, Jervis (a writer on the subject) says that which lies around Carlo Forte is most exquisite ; and for hardness, colouring, and vivacity of tint it is eminently adapted for building purposes. The upper, newer, and columnar rock is hard, and varies from trachyte to trachytic porphyry. The minerals scattered through it are in a normal condition ; moreover, there is no appearance of bedding, except at the base. The trachyte of the island in some points appears inclined, very uniformly, 25° to north north-east. The percentage of manganese in the best portions of the mine will be from 31 to 35 per cent., and the ore will contain from 7 to 13 per cent. of iron. The second quality will contain about 20 per cent. of manganese, and about 14 per cent. of iron.

In the more manganiferous portions of the ore there is a considerable quantity of free silica, which must render this portion of the bed, to a great extent, inadaptable to the manufacture of ferro-manganese. Manganese being scattered through the tufa, its presence as a crystalline peroxide in fissures in the trachyte is readily accounted for. The origin of the bed is not so apparent. No doubt the trachytic tufa of the Sardinian provinces of Cagliari and Sassari were derived directly—like a similar rock of the Siebengebirge—from volcanic eruptions, and it is not a mere conglomerate formed by the wear and tear of an older rock. A careful examination with a lens abundantly proves this. The manganese appearing in the tufa in tiny patches, and its presence, too, in minute portions in the magnitude with which the rock is scattered, incline to the belief that manganese was somewhat largely present in the lava as it flowed—or perhaps it would be nearer the truth to say in the ashes as they dropped into the water. The temperature of the latter would under such circumstances be gradually raised until it was more or less saturated with bi-carbonate of manganese, together, of course, with some iron. The carbonates would be gradually oxidised by the free oxygen in the water, or they would change their carbon dioxide by heat, and dioxide of manganese and peroxide of iron would be deposited in films.

The mode of working is to drive cross-cuts from the gallery in the direction of the strike ; a rise is then put up from this cross level through the bed ; small beds, 4 to 4½ ft. high, and kept open by good timber at the sides and top, are next driven towards the rise of the bed. The men first hole into the soft clay floor with a somewhat curved pick, having a hammer head prolonged some inches beyond the handle. The clay, which they constantly throw behind them, forms the *remblais* with which the old workings are filled up. The manganese is afterwards brought down by sledge hammer and long thick wedges. The ventilation is somewhat sluggish, and the temperature abnormally high, and although the mine is above sea level, the men work bare to the waist, even in winter. There is a large portion of water (20 per cent. and upwards) in some of the qualities as sent to market, which shows that some means of drying it should be adopted at the mine. A good round sum has been spent in attempting to solidify the ore by forming it into bricks, but as yet no satisfactory result has been obtained. The mine is cheap to work, or else it would have been useless to go on with any show of success, when so often, too, the bed contains on an average only 30 per cent. of manganese.

It can be delivered at about 16s. per ton f.o.b. at Carlo Forte, and in the year 1881, 4895 tons were raised, at a value of 6600*l.* ; and in round numbers 44,000 tons have been raised in all, realising 57,700*l.*, giving an average value of 26s. 2d. per ton. In 1878, 178 workmen were employed.

THE MARSAUT LAMP.

Mr. M. WALTON BROWN read a paper "On the Marsaut Lamp.' The following is an abstract :—This safety-lamp, the recent invention of Mr. J. B. Marsaut, the chief engineer of the Bessèges Coal Company, exhibits in general form and construction the Mueseler types. There is nothing special in the lamp bottom, with the exception of a flat wick, which has been adopted so as to increase the lighting power of the lamp. The glass used is of considerable thickness and carefully ground at both ends to secure an efficient joint. There are two gauzes ; the inner affords a large surface for the cooling and escape of the burnt gases, while the outer one is attached to a copper flange which holds the glass.

It is provided with a protecting shield, which is removable, and made independent or not of the lamp when locked. It is furnished at the bottom with openings for the feed air, placed as low as possible, so as to be opposite the ring at the bottom of the gauze, and prevent the direct entry of horizontal currents into the lamp. A simple and exceedingly effective locking apparatus has been adapted to the lamp by the inventor, Mr. W. J. H. RYDER, of the firm of Messrs. J. Mills and Son, Newcastle, who are the makers of the lamp in Great Britain. In the construction of the lamp, Mr. Marsaut has carefully taken the following influences into consideration :—

The internal volume of the lamp, and the ratio between the volum and the surface of gauze

Influence of the burnt gases.

Mode of admission of the air supply.

From experiments made by placing lamps into a bell in order to receive the gas, and then lowering them to its edge, it was found that lamps of large internal volume were dangerous in consequence of the violence of internal explosion, and the relative frequency of external ignitions.

It also appears that the isolation, by any means, of the burnt gases is an element of danger, and that the part performed by these gases constitute an element of safety in the Clanny and Boty lamps. By tests in the bell it is seen that the flame rarely extends below the level of the flamer, when the air is admitted from above. In the case of a high wick the phenomena is very apparent ; there appears to be a cushion of air at the bottom of the glass which reduces the explosive volume, and whose elasticity must reduce the intensity of the explosion. From experiments upon the Boty lamp, in which the air descends from above, and the Westphalian lamp, with air admitted from below the glass—with lamps of the same shape, volume, and gauze—it was found that while the Boty lamp did not cause one external explosion in 2094 trials, the Westphalian lamp failed thrice out of 640 trials.

Repeated trials have also shown the insufficiency of a single gau Thus a Gard-Davy lamp, with a gauze of 2⅜ in. diameter, gave repeated failures ; but the addition of an inner gauze, separated a little from the outer one, rarely allowed the passage of the flame to the outside. Two similar gauzes in the Boty lamp have always resisted the flame, even with the addition of the Mueseler chimney. The advantages claimed by Mr. Marsaut for his lamp, and which have now been verified by numerous experiments, are :—

1. It does not go out so readily, when inclined, as the Mueseler

lamp, and cannot be inclined for such a length of time so that the flame may crack or smoke the glass.

2. It is not extinguished in vertical ascending or descending currents of air.

3. It does not cause external explosion when exposed to rapid explosive currents under ordinary conditions.

4. It does not cause external explosion when introduced into still explosive mixtures.

5. The gauzes are protected from external injury by dust or water.

6. The burnt gases resulting from internal explosion are momentarily retained within the shield, and aid in the extinction of the lamp by mixing with the air supply.

7. The lamp can be readily extinguished when required by obstructing the supply and smoke openings by means of the hand or jacket.

EARTH SHAKES, AND FIRE-DAMP.

A paper by Mr. M. WALTON BROWN, read at a former meeting "On the Observation of Earth Shakes, or Tremors, in order to foretell the issue of Sudden Outbursts of Firedamp," was discussed.

Mr. BROWN said he had been in communication with Mr. Ewing, now of Dundee University, and who formerly had made observations of earth shakes in Japan. Mr. Ewing had received a grant of 100*l.* from the British Association to conduct observations on earth shakes on the top of Ben Nevis. He (Mr. Brown) intended to place at Sunderland, where earth shakes had been felt, an instrument similar to that used in Japan. Experiments were conducted at a Government mine in Japan, and it was found that there was an increase of gas 10 hours after a shake was observed.

Mr. BUNNING (secretary) said he could not find any rule, and he thought nobody else had, whereby the barometer afforded anything like a sign of the state of a mine with regard to explosions; and it seemed to him that Mr. Brown's paper was valuable in that it led them to think of graver sources of accident connected with phenomena associated with the crust of the earth, and notably earth shakes. The earth was permeated with fissures, and earth shakes might open or close fissures, and so cause the movement of gas in pits in a way which it was utterly impossible to find out by any hitherto practiced means. He believed the barometer was now generally admitted to be of very little use in this matter, and they must direct their attention to the constantly varying phenomena of Nature to find out what bearing they had upon coal pits.

Prof. LEBOUR said nearly every country in Europe, except England, were conducting observations on earth shakes, and he suggested that this Institute make arrangements for a series of observations.

The PRESIDENT suggested that Prof. Lebour should bring the matter before the board of the Institute.

The meeting concluded.

THE INSTITUTION OF CIVIL ENGINEERS.

At the ordinary meeting on Tuesday last—Sir Frederick J. Bramwell, F.R.S., President, in the chair, the first paper read was "On the Metropolitan and Metropolitan District Railways," by Mr. Benjamin Baker, M.Inst.C.E. In this paper the author commenced with a brief account of the early history of the undertaking, its gradual development, and like matters not of a strict engineering character, and he then proceeded to consider the engineering features of the line, its gradients, tunnels, sewer crossings, and other ordinary and special works. The first length of Metropolitan Railway constructed was that from Paddington to the City. In 1814 Paddington was described as "a village situated on the Edgware-road, about 1 mile from London. Forty years later the Act of Parliament for the railway from Paddington to the City was obtained, and 30 years then elapsed before the whole of the "Inner Circle" Railway was completed. The original intention was to work the Metropolitan Railway by hot-water locomotives, burning no fuel, and condensing the steam; consequently no special provisions were made for ventilation. It was also thought that trains weighing 20 tons, inclusive of passengers, would be the heaviest that could be usefully employed. At present the trains weighed 120 tons; and as they were hauled by coal-burning locomotives weighing 45 tons, it was hardly a matter for surprise that additional ventitation was required on certain portions of the line. In 1860 Mr. Fowler, Past-President Inst. C.E., had a special experimental locomotive built by Messrs. Stephenson, of Newcastle, but it did not prove a success. The engine had a small fire-box, a large mass of fire-brick stowed away in a chamber in the barrel of the boiler, and an injection-condenser, with air-pump. When the line was opened in January, 1863, it was worked by coke-burning locomotives provided with condensers. The engines were 6-wheeled broad gauge tank locomotives, having four coupled wheels 6 ft. in diameter, and cylinders 16 in. by 24 in. The present engines were eight-wheeled, and had four coupled wheels 5 ft. 9 in. in diameter, and cylinders 18 in. by 24 in. The contour of the ground traversed by the "Inner Circle" Railway was not easily recognisable, owing to the surface being densely covered by buildings of varying heights, and the natural water-courses being converted into sewers. In early historical times the little hill on which the City stood was fronted by a wide stretch of tidal marshland, and flanked by the Fleet river and the Wall brook. West of Westminster the river extended inland at least a mile, forming the swamps of St. James's Park, Pimlico, and Fulham. To the north extended the rising ground culminating in the heights of Hampstead and Highgate, and the lesser heights of Campden Hill, Primrose Hill, and others. The highest ground traversed by the railway was at Edgware-road, and the lowest near Victoria-street, Westminster, the respective heights being 103 ft. and 8 ft. above Ordnance datum. Between the spurs of the northern heights ran the West Bourne, the Ty-Bourne, and other minor streams, now converted into sewers, which crossed the railway at Baker-street, Warwick-road, Sloane-square, King's Cross, and other points, in iron tubes ranging in size up to 14 ft. by 11 ft. The physical features of the ground, and not the presence of buildings, determined the gradients. On the south the rail level was 13 ft. below Thames high water, on the north 60 ft. above it, and, as the ground dipped from north to south at a steeper slope than was admissible on a railway, deep cuttings and tunnels were necessitated on the eastern and western portions of the circle, and gradients of 1 in 79 and 1 in 100 had to be introduced. As regarded the character of the ground cut through, about 24 ft. of ruins and dust were met with in the City and at Westminster, about 50 ft. of mud and silt at Charing Cross, and layers of peat were found at varying depths in the swampy ground of Westminster. The characteristic section, however, was a river drift deposit of gravel, sand, and brick earth overlying the London clay, which deposit was found alike in Westminster at a level of 8 ft., and in Marylebone at 103 ft. above ordnance datum. The remains of animals swept down by floods indicated that the gravel must have been deposited at a time when the mammoth, rhinoceros, und hippopotamus roamed about the valley of the Thames. The first 42 miles of Metropolitan Railway were laid with mixed gauge, and the remaining 8¼ miles with narrow gauge, the respective width of tunnels and open cuttings being 28 ft. 6 in. and 25 ft Where a junction occurred between two lines in covered way a "bellmouth" was constructed; that at Praed-street had a wrought-iron elliptical top 28 ft. 6 in. wide at one end, and 60 ft. at the other, the structure much resembling the inverted hull of a large iron ship. Where there was not sufficient depth for a brick covered-way, cast-iron girders were as a rule adopted. At average contract prices the 25-ft. brick covered-way in 25-ft. cutting cost 39*l.* per lineal yard, and the girder covered way in 17 ft. 6 in. cutting, 52*l.* There were three tunnels on the "Inner Circle," the Clerkenwell tunnel, 728 yards, the "Widening" tunnel, 733 yards, and the Campden Hill tunnel, 421 yards in length. The two former were in London clay, and the latter was driven through a wet mass of gravel and sand, extending generally down to the springing. At average contract prices the 28 ft. 6 in. tunnel cost 70*l.*, and the 25 ft. tunnel 63*l.* per lineal yard. A settlement of the ground over and contiguous to the tunnels had taken place in most instances, and the causes of this were carefully investigated. In the open cuttings retaining walls of brickwork and concrete, with or without cast-iron struts, were adopted. Without struts the cost in 25 ft cutting was 66*l.*, and with struts 55*l.* per lineal yard. Where the depth was 42 ft., two rows of struts were employed, and the cost was 108*l.* per lineal yard. In executing the works the character of the timbering varied from time to time under different contractors; but finally the general practice was to build the walls in trenches and remove the dumpling afterwards, the timbering being much lighter than when the excavation was carried out full width. There were 27 stations on the 13 miles of "Inner Circle" Railway. The Baker-street, Portland-road, and Gower-street stations were covered by segmental brick arches, 45 ft. span, and the Temple Station, Mansion House Station, and some others, were more or less underground. Wherever practicable "daylight" stations with light elliptical iron roofs were adopted. Many special works occurred on the line. Sewer-diversions, gas and watermains, maintenance of road-traffic and the support of buildings, presented problems of great novelty. At Park Crescent, where the line passed under two houses, the latter were pulled down and rebuilt on iron girders; but at Pembridge-square, the girders were introduced without taking down the houses. At Farringdon-street, underpinning works of great magnitude and difficulty were executed, and along the line many cases of successful underpinning occurred. Since the completion of the works, buildings up to 80 ft. in height had been erected over the railway, sometimes on girders and sometimes on brick arches, and no difficulty had arisen from vibration. The Paper was accompanied by diagrams illustrating the ordinary and special works on the 11¼ miles of "Inner Circle" Railway, with the construction of which the author was personally connected, his partner, Mr. Fowler, having been the engineer-in-chief.

The second paper read was "On the City Lines and Extensions (Inner Circle Completion) of the Metropolitan and District Railways," by Mr. John Wolfe Barry, M.Inst C.E. It was observed that the completion of the circle had always been kept in view by both the Metropolitan and the District Companies, and Parliament was at all times in favour of the undertaking. After many failures to realise the project, the two companies, in 1878, agreed to refer the mode of completing the "Inner Circle" to Sir John Hawkshaw. He recommended the extension of the railway southward from Aldgate to Tower Hill, and thence westward along Great Tower-street, Eastcheap, and Cannon-street, to join the District Company's railway at Mansion House, and that the Corporation and the Metropolitan Board of Works should be invited to join with the two companies in widening Eastcheap and Great Tower-street, and in the construction of a new street between Mark-lane and Trinity-square. The author was appointed joint engineer with Sir John Hawkshaw. An important addition to the project was an extension eastward to join the East London Railway, so as to serve the large population of East and South London. After describing the route of the line the author observed that the term "Inner Circle" was somewhat of a misnomer. The Metropolitan and District Railways formed an irregular ellipse rather than a circle, and the eastern portion of the ellipse was so flat that the two lines were approximately parallel and near to each other for some distance. The Parliamentary estimate was:—For the railway and land, 2,365,261*l.*; for street widenings and a new street, 929,412*l.* After lengthy negociations it was agreed that the Metropolitan Board of Works should contribute 500,000*l.*, and the Commissioners of City Sewers 300,000*l.* towards the undertaking. The works were commenced in August, 1882, and were completed and opened for traffic (together with the Whitechapel extension) in October, 1884.

The location and setting out of a railway amid such a collection of streets, churches, railway stations, warehouses, shops, and offices, between Mansion House station and the Tower of London involved anxious consideration. It was often a question of a few inches whether an important and expensive building could or could not be avoided. The course of the railway being approximately parallel to the Thames, many important sewers were of necessity intersected. In all cases the sewers had been carried under the railway without resorting to inverted syphons; but there had been important alterations of the sewers themselves. It was also necessary to construct a new sewer on both sides of the railway throughout its course in Cannon-street and Great Tower-street, and a portion of Eastcheap. The old sewer down the middle of the road was removed to leave room for the railway, but it had to be kept in use, or temporary troughs had to be employed until the new sewers were finished. Upwards of 300 new connections between the drains of the houses and the sewers had to be made. These sewer works added greatly to the difficulties of carrying out the railway.

The sections of the covered way, which was partly of brick arch and partly of girder-work, were then described. The holes excavated beneath the foundations of buildings for underpinning were usually about 4 ft. long. After the holes had been carried to a good foundation, they were filled with Portland cement concrete, and allowed to stand for 36 hours. The top portion of the underpinning was executed in brickwork in Portland cement, With a single exception there was no settlement or damage to any of the underpinned buildings. One work of the underpinning was the granite statue of King William IV., supported upon a granite pillar finely jointed, and resting upon a foundation of lime concrete. A work of some interest was the carrying the railway beneath the warehouses on the south side of Great St Thomas Apostle and Cloak-lane without pulling them down. This was accomplished by gradually inserting portions of the side walls, turning the arch of the tunnel intermediate between the party walls, and finally by uniting the lengths of arch through the party walls. Another difficult work was the carrying of the railway beneath the old viaduct of the Blackwall Railway. The foundations of the old viaduct were removed, and underpinning was substituted, without disturbing the structure or interfering with the traffic of the Great Eastern and Tilbury and Southend Railways. An important part of the work of constructing a railway through the heart of the City of London was the temporary works for keeping the street traffic open. The first operation was to lay down at night, over such a length of street as could be safely undertaken with a certainty of the operations being finished before 6 o'clock in the morning, the cross-timbers running from one side of the street. These were 12 in. by 12 in., and placed 3 ft. apart from centre to centre. Upon them were laid 4-in. planks longitudinally with the roadway, and on the top of these 3-in. planks at right angles to the roadway. The next operation was to drive the main heading, and from it cross headings, by which to approach the backs of the cellar walls of the houses. These walls was then broken through, and access was thus obtained to the foundations of the front walls of the buildings without disturbance of the roadway or foot pavement. Where there were no cellars the headings were continued up to the front walls, and a side-heading was driven parallel to the houses. From the side-heading, or else through the cellars, underpinning holes were then sunk beneath the foundations, and the concrete and brickwork were placed in position. When the underpinning was completed the main trenches for the side walls and the sewer were undertaken. The arch was then turned and the backing put in. The stations between the Mansion House and Aldgate were three in number—Cannon-street, Monument, and Mark-lane. Cannon-street Station had to be constructed partly under Dowgate Hill, where there was only 1 ft. of available height between the top of the railway and the road, partly under the forecourt of Cannon-street Station and partly under Cannon-street. The booking office had to be accommodated between the top of the railway construction and the surface of the forecourt, and provision had to be made for interchange of traffic with the South-Eastern Company's Cannon-street Terminus. Thus, under the forecourt there were three tiers of traffic, (1) the trains, (2) the passengers using the booking offices, and (3) the cabs and carriages in the forecourt. The total height from the level of the rails to the surface of the forecourt was 25 ft. 6 in. Monument Station was constructed on the site of the old Weigh House Chapel, and had more area open to the sky than the other stations. The northern side-wall of the station was so far north of the southern face of Eastcheap that much intricate girder work was required, more especially as it was necessary to provide for carrying a row of buildings on the south side of Eastcheap. Mark-lane Station was constructed wholly beneath the new street, and was covered by girders in one span of 52 ft., the jack arches in this case being at right angles to the line of the railway. The minimum length of the platforms at all the stations was 300 ft., and the minimum width of each platform was 16 ft. The width of the stairs was generally about 8 ft., and the stairs and lobbies were in all cases recessed so as not to encroach on the minimum width of the platforms. The Act of Parliament gave the companies the right to construct ventilators in the roads and open spaces, such as those known as blow-holes, but when the works were being undertaken the agitation against the blow-holes was at its height, and Parliament had gone so far as to take away from the District Company the right to retain some of the blow-holes which it had in a previous session authorised them to construct. It was therefore decided to adopt the alternative which had been pressed upon the District Company by the public authorities, and to put up fans to exhaust the foul air from the tunnel by machinery. Accordingly fans had been erected—one in Cannon-street, midway between Cannon-street and Monument Stations, another midway between Monument and Mark-lane, and one in the Whitechapel-road. The fans had no sooner been set to work than complaints were made that they occasioned vibration, and an injunction to restrain the companies from using them was granted. In the case of the blow-holes the power was provided by the induced current due to the passage of the trains, and thus each hole acted as a lung, working rateably with the number of trains travelling on and fouling the railway. Thus the same agency which fouled the air of a tunnel by the passage of an engine, supplied the power of purifying the air. The cost of the works had amounted to about 20,000*l.* less than the Parliamentary estimate, and the land was also less than had been estimated. No serious accident occured in carrying through the enterprise. The works were prosecuted with great energy and fertility of resource by the contractor, the average number of men employed at times being about 850 by day and 500 by night.

MANCHESTER ASSOCIATION OF EMPLOYERS AND FOREMEN.

The 29th annual dinner of the members of the above Association was held on Saturday last at the Grand Hotel, Manchester—Mr. W. SUMMERS, M.P., occupying the chair. The report for the past year, read by the secretary, showed a balance to the credit of the Association of 2455*l.*, after payment of all accounts up to date, and after deducting the sum of 100*l.*, arising from the winding-up of the Osborne Building Society. But for this unfortunate loss the year's working of the Association would have shown a balance of 63*l.*, notwithstanding the decreased income from investments in building societies. The expenditure during the year has been exceptionally heavy, 40*l.* having been paid as funeral allowances on behalf of deceased members, and 112*l.* to superannuated members. Owing to this heavy demand the committee had been compelled to reduce the payment to superannuants from 10s. to 7s. 6d., and afterwards to 5s. per week. During the past 12 months 3 life honorary, 13 honorary annual and 18 ordinary, making a total of 34 new members, had been admitted; but taking into account the losses by death, resignation, or erasure, the effective addition to the membership lists had only amounted to 21, bringing the total number of names of all classes on the roll of the Association to 244.

The CHAIRMAN, in proposing the toast of "The Manchester Association of Employers, Foremen, and Draughtsmen of the Mechanical Trades of Great Britain," said he was sorry they had not in the chair some one more qualified to do justice to the toast. At their last annual meeting they had the honour of having in the chair Mr. Daniel Adamson, who had great practical knowledge of engineering, and had done great service to mechanics by his experiments on the strength of metals, with especial reference to the different varieties of iron and steel. Mr. Adamson was also closely identified with the project for a Manchester Ship Canal, which, if once made, would prove of immense advantage to the trade of the district. He did not see that there was any reason to despair that this work would be ultimately accomplished; although the Bill had been thrown out by a Parliamentary Committee there was good reason to hope that the third application, now being made, would be successful. There was no such word as fail in Mr. Adamson's vocabulary, and the prophets of evil would, let them hope, be proved to be in the wrong. It was to be hoped that the promoters of the Manchester Ship Canal would triumph over the various obstacles that still stood in the way, and that Association, he was sure, most heartily wished them success. That Association was based on the principle of uniting together masters and men, and proved that employers and employed could work harmoniously together. During the 29 years it had been in existence it had gradually grown until it had attained its present flourishing condition. In addition to the pecuniary assistance which it afforded to its members, when this was required, the Association had for one of its principal objects more frequent exchange of opinions on interesting questions constantly arising from the progressive nature of the mechanical trades. This object had been admirably carried out in a series of papers and addresses delivered in the Lecture Hall of the Manchester Technical School. A great change had recently come over the engineering world. Formerly it was the custom to preserve the utmost secrecy with regard to improvements in mechanical science; now the utmost frankness prevails, and with this change of policy there had been a rapid development of the trades connected with the iron, steel, and allied branches of industry. A change had also come over the mind and feelings of the working classes with regard to improvements and inventions which resulted in the saving of human labour. The inventor was now recognised as the friend of the working man, and the effect of the improvements in machinery was seen to have been not only to cheapen the cost of production, but also to increase the wages, while lessening the hours of labour. The progress of mechanical science which had been so rapid and astonishing in recent years had conferred the greatest blessings on the human race. In this great work that Association had borne no inconsiderable part. He congratulated it on what it had already accomplished, and confidently predicted for it a future yet more glorious than its past had been.

Alderman W. H. BAILEY, the President of the Association, briefly responded to the toast.

THE 26th annual meeting of the London General Omnibus Company (Limited) was held on Tuesday at the chief offices, Finsbury-square. Mr. John Pound presided, and, in moving the adoption of the report, congratulated them on its satisfactory character. Notwithstanding the reduction in the passenger duty, most chairmen of the great carrying companies had been obliged to face their shareholders with diminished profits and smaller dividends; but he was happy to be able to state that their report showed the largest profit ever made by the company in any one half-year. Compared with the corresponding period of 1883 their traffic receipts had increased by 3·61 per cent. The public seemed to appreciate cheap fares and the penny fares, and personally he was in favour of cheap travelling. Their average fare had been less, but they had earned more per omnibus per day and per mile. With regard to the expenses, they had been rather more in amount, showing an increase of 5091*l.*; but the percentage in the past half-year had been only 85·86 per cent, as compared with 87·35 per cent. in the corresponding period of 1883, being a decrease of 1½ per cent. Provender had not been so cheap since 1880. Had it been the same price it was three years ago, instead of the profits being 50,000*l.*, it would have been only about 5 per cent. on their capital. That fact was sufficient reason for placing, as the directors proposed, 10,000*l.* to the general reserve for equalising their dividends, and they also proposed to put 5000*l.* to the leases renewal and building fund. Their reserve fund now amounted to 120,000*l.*, but, with their experience, he would not be satisfied until that amount had been increased to 150,000*l.*

THE ENGLISH CROWN SPELTER COMPANY.—A dividend of 10 per cent. per annum, will be payable on March 3, less income tax.

FOREIGN MINING AND METALLURGY.

The French Iron Trade has continued depressed, but prices have scarcely varied. Iron has been maintained without change at 5*l.* 8s. per ton; a quotation of 5*l.* 12s. per ton has been occasionally noted. At the next meeting of the French forgemasters, one of the questions which will come up for discussion will be the propriety of reducing the current quotation of 5*l.* 4s. per ton. The six great French railway companies have still 1250 miles of line to construct; and this ought, *prima facie*, to import some strength to the French iron trade; but the construction of the new lines may, of course, be spread over a very lengthened period. Iron and pig have been in comparatively little demand in Germany, and the general condition of German metallurgical affairs is far from brilliant. The production of pig of various descriptions in Germany last year is returned at 3,572,000 tons, as compared with 3,470,000 tons in 1883, 3,380,000 tons in 1882, 2,914,000 tons in 1881, 2,729,000 tons in 1880, and 2,226,080 tons in 1879. The production of coal in the Nord, and the Pas de Calais last year was 9,430,504 tons, as compared with 10,051,461 tons in 1883, showing a reduction of 620,957 tons last year. The production effected in the Nord last year was 3,401,375 tons, as compared with 3,303,212 tons in 1883. The production of the Pas de Calais last year was 6,029,129 tons, as compared with 6,148,249 tons in 1883. The falling off in the production of the Nord last year was about 12 per cent.; that of the Pas de Calais was about 2 per cent. No less than 30 years have elapsed since the production of the ten departments experienced a check similar to that now indicated.

As regards the Belgian Iron Trade, it appears that orders for some thousand tons of iron and girders have been recently received by the rolling-mills of the Hainaut. Quotations have experienced little change. English casting pig has been maintained upon the Belgian markets at about 2*l.* per ton. Hard refining pig has been quoted at 1*l.* 18s. 4d. per ton, while ordinary pig has realised 1*l.* 15s. per ton, and mixed pig 1*l.* 12s. per ton. Athus has sold its production at about 1*l.* 12s. per ton. No. 1 iron has been weak at 4*l.* 10s. to 4*l.* 12s. per ton, while Nov. 2 has made 4*l.* 16s., and No. 3 5*l.* 2s. per ton. Girders have realised 4*l.* 16s. to 5*l.* per ton on home account. No. 2 plates have made 5*l.* 12s. to 5*l.* 16s. per ton, while No. 3 have brought 6*l.* 12s. per ton. Plates of commerce have remained at 8*l.* 4s. per ton. The Belgian National Local Railways Company has just announced an adjudication of 3000 tons of rails and accessories; this is regarded as "some satisfaction given to national industry," but regret is expressed that the satisfaction is not more complete. The authorities of the Hainaut have not yet arrived at any decision with regard to certain new lines of local interest in contemplation in that province. The imports of iron minerals into Belgium in 1884 were 1,487,748 tons, as compared with 1,612,470 tons in 1883. The exports of iron minerals from Belgium last year were 190,788 tons, as compared with 367,104 tons in 1883. The exports of steel rails from Belgium last year were 63,977 tons, as compared with 80,009 tons in 1883. The exports of iron rails from Belgium last year were 19,786 tons, as compared with 9455 tons in 1883. Plates were exported from Belgium last year to the extent of 38,869 tons, as compared with 48,150 tons in 1883.

The contingency is beginning to be realised in Belgium that the winter may now pass away without any further spell of cold weather, at the same time Belgian colliery proprietors have had a good season, and have no reason to complain upon the whole. Stocks are not excessive, and all branches of the Belgian coal trade may be said to be in a satisfactory condition, excepting coking coal, which continues to show some depression. Prices have remained substantially at about the same level. The imports of coal into Belgium last year are returned at 1,221,676 tons, as compared with 1,263,334 tons in 1883. English coal figured in these imports for 298,284 tons and 297,781 tons respectively. Coke was imported into Belgium last year to the extent of 32,878 tons, as compared with 38,898 tons in 1883. No English coke appears to have been imported by Belgium during the last two years. The exports of coal from Belgium last year were 4,608,606 tons, as compared with 4,441,314 tons in 1883. In these totals the exports of Belgian coal to France figured for 4,331,210 tons and 4,153,849 tons respectively. The exports of coke from Belgium last year were 849,506 tons, as compared with 996,645 tons in 1883. Coal quotations have remained at about their former level upon the German markets. It cannot be said that German coal mining has been in a satisfactory condition during the last 10 years. Prices exhibited a downward tendency from 1874 to 1878, they revived a little between 1878 and 1881, but they have since been again declining.

THE STEEL SYNDICATE OF NEW SOUTH WALES.—Another vigorous effort is being made to establish the manufacture of iron and steel from native ores in New South Wales. A meeting has been held in Sydney for that purpose, at which it was decided to form an association to be called the Steel Syndicate of New South Wales. The syndicate is stated to be promoted to work an invention of Mr. W. H. Harrison, of Sydney—a process which has been patented under the title of the "Australian system of reducing iron ores." The failures of former attempts to work native iron ore is attributed to the manipulators rigidly adhering to the processes carried out in England, Scotland, Wales, and other places, without taking into account the pecularities in the colonial ores which might render those processes inapplicable. It is claimed for Mr. Harrison that he has invented a process of separating iron from the impurities chiefly found in connection with the ores by means of hydrogen gas, the impurities being carried off in a gaseous condition, leaving pure iron in the furnace. One of the speakers at the meeting (Mr. G. Foote), speaking as a practical man in the iron and steel business, considered that Mr. Harrison's invention would prove as great a thing for Australia as Sir Henry Bessemer's invention was for England. Arrangements have been entered into with the City Ironworks, Pyrmont, to erect a furnace on their land, and to have the iron tested by means of their steam hammers and their rollers. One object of the syndicate is to try to secure to the colony the Government contract for 150,000 tons of steel rails, to be supplied at the rate of 15,000 tons per annum during the next 10 years. If the Harrison process should turn out to be a success when worked on a large scale it is hoped that pig-iron will be made from colonial ore at 2*l.* 18s. 11½d. per ton, as compared with 85s. per ton paid in Sydney for English ore, while on bar-iron they expect to save 3*l.* 10s. per ton.

THE 13th ordinary general meeting of the Improved Wood Pavement Company (Limited) was held, last week, at the City Terminus Hotel, Mr. A. R. Grenfell presiding. In moving the adoption of the report the Chairman observed that they had been steadily prospering for the last nine years. The reserve fund of 10,136*l.* had all been built up in the same time, during which they had also written off a large number of collateral charges. Some of their pavement had been down for eight or nine years; and in no case, he believed, had any surveyor of London accused them of neglecting their obligations as to keeping the pavement in efficient condition. It was true that fortune had smiled on them in many ways. Two of their competitors, for instance, had gone, and they had also the benefit of the low price of timber, of their increasing experience, and of their improved organisation. The competition they had still to contend against was very serious, but there were really only three or four substantial firms who endeavoured to obtain contracts for wood-paving. The motion was seconded and unanimously adopted after a few congratulatory observations from Sir W. P. Andrew, at whose suggestion 600*l.* was voted to the directors as a bonus. The retiring directors and auditors were re-elected.

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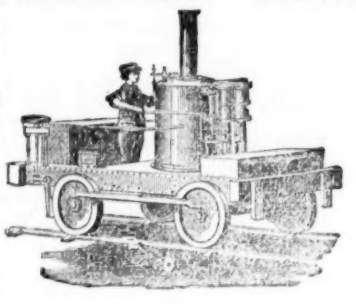

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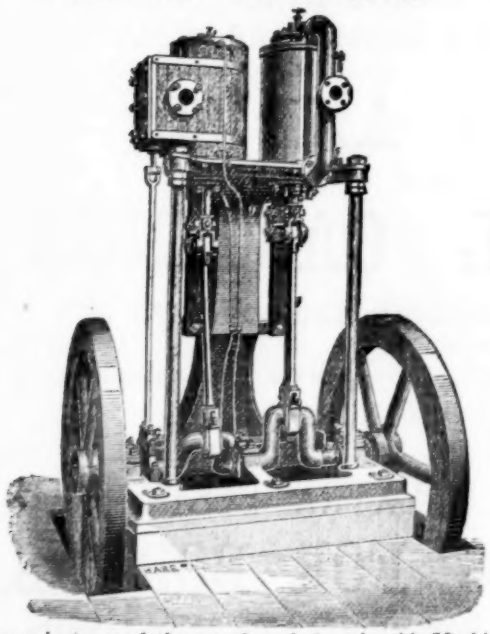

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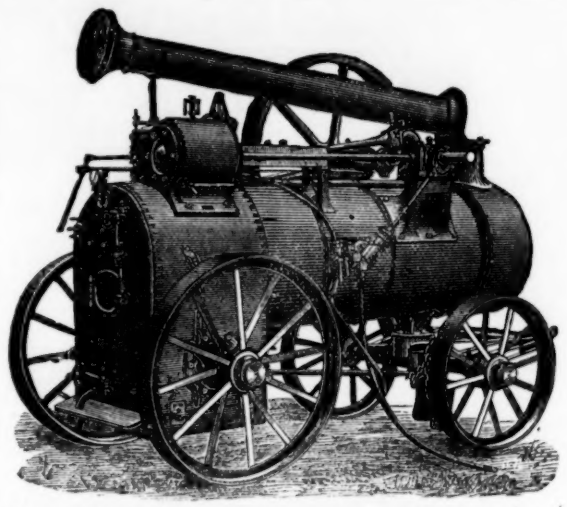

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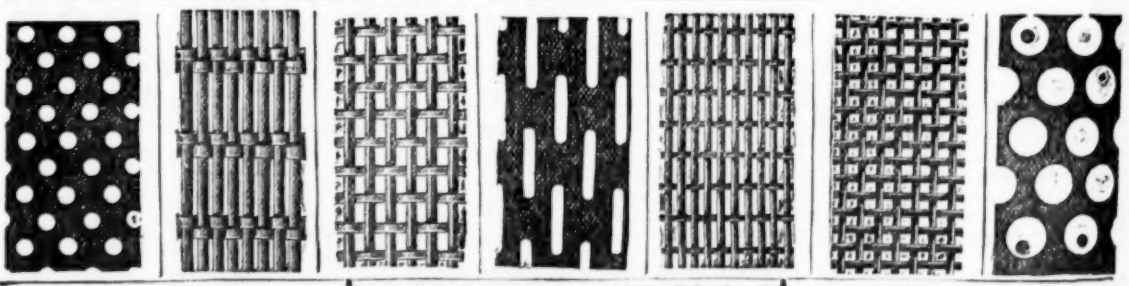

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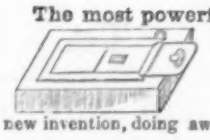

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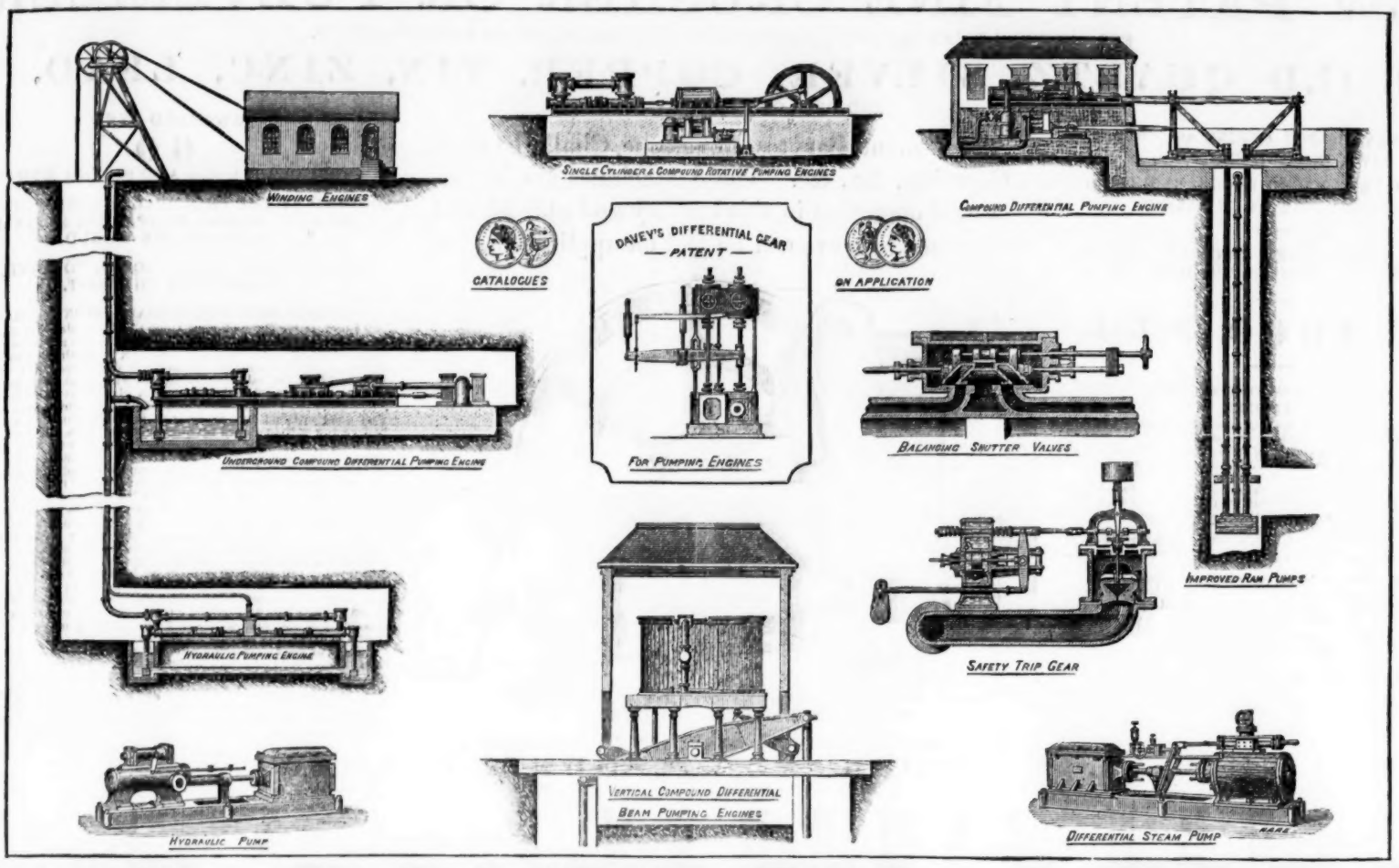
Shipments effected from LONDON Stock also from ANTWERP or HAMBURGH.

Sold by WM. BRODERSEN, 79, Leadenhall-street, London, E.C.
SOLE AGENT FOR THE UNITED KINGDOM AND THE COLONIES.

HATHORN, DAVEY & CO.,

PUMPING MACHINERY.



MINING MACHINERY.

SUN FOUNDRY, LEEDS.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High Pressure Engines

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. P. EVANS,
Late H M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell.

JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that 1/16 in. thick of incrustation causes a waste of 15 per cent. of coal; ¼ in., 60 per cent.; ½ in., 150 per cent.

Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel.

It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient.

Sold in drums and casks bearing the Trade Mark, without which none is genuine.

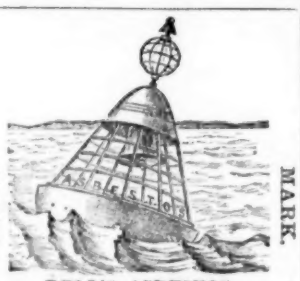
BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.

DEAR SIRS,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.

I am, dear Sirs,
Yours faithfully,
THOMAS WINTER, Colliery Engineer.



BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.

BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

DEAR SIR,—It may interest you to know that we save exactly 40 per cent. in fuel through using your covering.

Yours truly,
W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),
Gunnislake, Tavistock, 8th April, 1884.

Mr. John Bell, Southwark, S E.

SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,
W. J. CHALK, Assoc.M.Inst.C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from ⅝ in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and ⅛ millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.

JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT).—This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

ASBESTOLINE

R.D.

—THE BEST LUBRICANT FOR ALL KINDS OF MACHINERY ASHORE OR AFLOAT.—

2/3 Per lb.

1 LB. EQUAL TO 2 GALLONS OF BEST OIL.

BELL'S "ASBESTOS LUBRICANT."

"REG^D

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S. E.

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 46, James Street, Bute Docks, CARDIFF. 21, Ritter Strasse, BERLIN.

THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTEE AND ONLY MAKER

H. R. MARSDEN,

ALSO PATENTEE AND ONLY MAKER OF THE

NEW PATENT FINE CRUSHER OR PULVERIZER,

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED,

GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD,

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CUBING and CRUSHING JAWS, IN FOUR SECTIONS,
WITH PATENT FACED BACKS, REQUIRING NO WHITE METAL IN FIXING.

CRUCIBLE CAST-STEEL CONNECTING RODS.
RENEWABLE TOGGLE CUSHIONS, &c.

OVER **4000** IN USE.

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.

AWARDED OVER
60
FIRST-CLASS GOLD AND SILVER MEDALS.

ADOPTED BY THE PRINCIPAL CORPORATIONS, CONTRACTORS, MINING COMPANIES, &c., IN ALL PARTS OF THE WORLD.

ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 × 10, to be of your very best construction, and to include two extra sets of Jaws and Cheeks for each. The last two 24 × 13 machines you sent me, which are at work in this colony, are doing very well. You will soon find that the railway contractors will adopt your machines in preference to the colonial ones—two of which I have. I know other contractors have had as many as nine of them, which have not given very good satisfaction. Once they know of yours thoroughly, I believe you will do a good trade with the colonies. For reference of the high character of your constructions you can refer to me as having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, both in point of construction and less liability to go out of order. The material we are crushing is very hard blue stone, for railway ballast purposes. Push on with the order as quickly as possible; I do not think it necessary to have any engineering inspection. I have brought your machines prominently under the notice of all large contractors in this colony, likewise the Government. Many of the contractors have spoken to me in reference to their capabilities, and I could only tell them that they are by far and away the best and most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and two above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

"Some of your testimonials do not give your machines half their due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) in a day than 200 men, and at 1-25th the cost."

EXTRACTS FROM TESTIMONIALS.
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

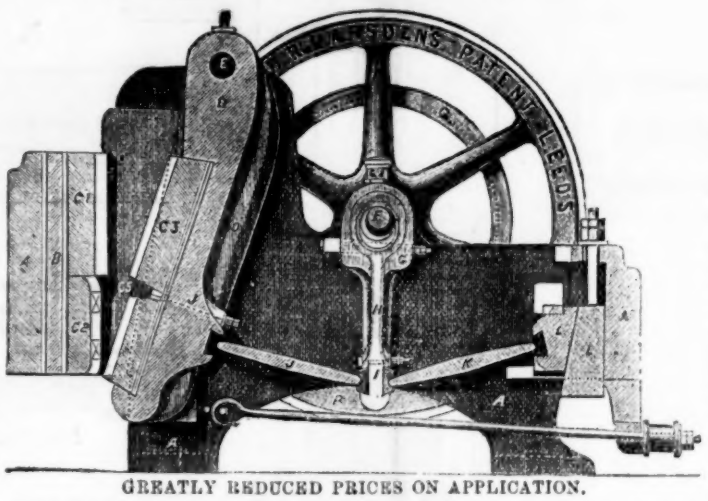
"In reply to your favour, I have much pleasure in informing you that the 12 × 3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverizing that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20 × 5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."



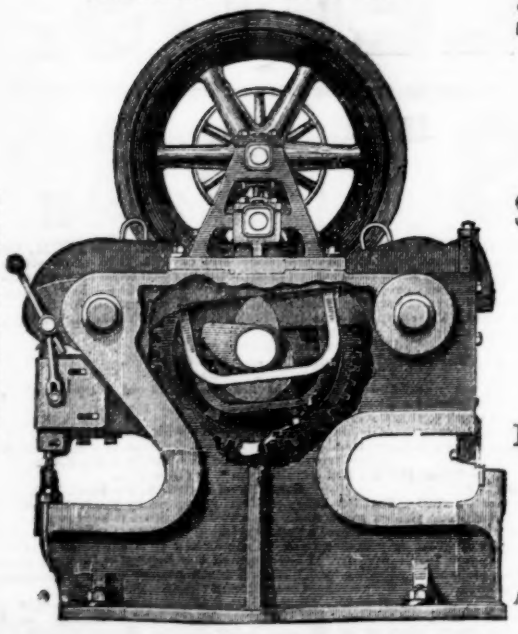
GREATLY REDUCED PRICES ON APPLICATION.

FOR CATALOGUES, TESTIMONIALS, &c., APPLY TO THE SOLE MAKER,

H. R. MARSDEN, SOHO FOUNDRY, LEEDS.

JOHN CAMERON'S

FLY-WHEELS ON BOTH SIDES.



DISENGAGING APPARATUS.

SPECIALITIES ARE HIS

STEAM PUMPS

FOR

COLLIERY PURPOSES.

Specially adapted for forcing Water any height

ALSO, FOR

SINKING, FEEDING BOILERS AND STEAM FIRE ENGINES,

Of which he has made over 9000.

ALSO, HIS

PATENT CAM AND LEVER PUNCHING & SHEARING MACHINES.

Works: Oldfield Road, Salford, Manchester.

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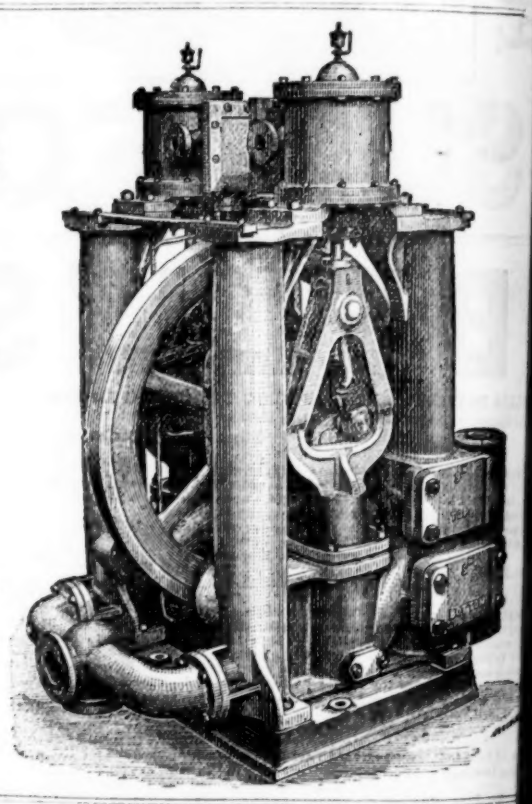
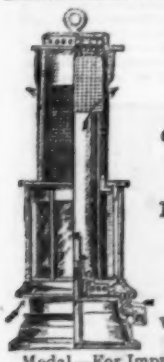
For NEWCASTLE and EAST COAST—E. BECKWITH AND CO., BONNERSFIELD, SUNDERLAND.



HEPBURN'S PUMP LEATHER WATERPROOF

By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

HEPBURN AND GALE, LIMITED,
TANNERS AND CURRIERS,
LEATHER MILL BAND AND HOSE PIPE MANUFACTURERS,
LONG LANE, SOUTHWARK, LONDON.
Prize Medals, 1851, 1855, 1878, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.



ESTABLISHED 1820

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SAFETY LAMP AND GAUZE MANUFACTORY,

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MIDLAND DAVY LAMP WORKS,
Belmont Passage, 203, Lawley-street,
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Makers of Williamson's Double Safety Lamp,
Williamson's Patent Double Safety Lamp shown half in section.

Medal—For Improved Invention—London, Kensington, 1874
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ESTABLISHED 1825.

EDWIN LEWIS AND SONS,

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MANUFACTURERS OF

Lapwelded & Buttwelded Wrought-iron, Steel, or Homogeneous Tubes

FOR EVERY

COLLIERY OR MINING PURPOSE.

J. WOOD ASTON AND CO., STOURBRIDGE

(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES, FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions

WELDED STEEL CHAINS { FOR CRANES, INCLINES, MINES, &c., MADE ALL SIZES.

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